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FOREWORD

Much of the history of mankind is the record of his ingenuity and creativity applied to the physical world around him. Today's scientific advances and sophisticated technology are the fruit of man's innovative spirit.

In that process, science and technology have become the absolute foundation of modern society. We will never again live in an era when this is not true. With the advent of each year and decade, this will only become a more pervasive reality.

Thus science and technology are basic determinants in our nation's equation for creating the new wealth of America and sustaining its economic growth and the continuing rise of its standard of living.

We are now a planet of interrelated and interdependent nations with one global economy. In that new economy, science and technology are primary components of our relationships with other nations. They are pivotal points of both cooperation and competition. They are the grounds on which we can cement strong and positive commitments with other members of the world community.

The State Department's Science and Technology Counselors are critical links in these international science and technology efforts. Their expertise in both the technical and the diplomatic aspects of international science and technology policy makes their understanding and advice invaluable to Members of the Congress and especially to our two Committees.

Science, Technology, and American Diplomacy 1989 was submitted to our Committees by the President pursuant to Section 503(b) of Title V of Public Law 95-426, the Foreign Relations Authorization Act, Fiscal Year 1979. Title V was enacted because of the conviction of many in the Congress that science and technology were among the strongest cards that the U.S. could play in its diplomatic relations. The intervening ten years have served to reinforce this view, as virtually all the nations of the world—rich and poor, developed and developing, East and West—have come to look to science and technology as the key to environmentally sustainable economic development. During the same time, the Title V report itself has become an increasingly useful and utilized reference tool both in the United States and overseas. This edition—the tenth in the series—is an improvement over last year's and demonstrates an effort to balance the vast amounts of data on the Federal Government's international S&T agreements (presented in summary form via a set of tables in the appendices) with information on the Secretary of State's implementation of the Act (contained in the five main chapters).

P.L. 95-426 required that the President transmit annual recommendations to Congress on: (1) personnel needs, standards, and training to fulfill the intent of law; (2) the continuation of existing

bilateral and multilateral activities and agreements primarily involving science and technology (S&T) activities (with an analysis of their foreign policy implications and technological benefits for the parties involved); (3) the adequacy of funding for these activities; and (4) plans for routine evaluation of the activities. We note, however, that this Report, like some of its predecessors, does not offer recommendations on these four measures: personnel, funding, implications for foreign policy of science and technology agreements, and plans for evaluation. We recognize the magnitude of the task of compiling the information that appears in this Report, but P.L. 95-426 specifically requests a level of evaluation that is not evident in this Report, but should be.

In 1988, both the Congress and the Administration pursued measures to improve protection of U.S. intellectual property rights (IPR) and to provide symmetrical access in international S&T activities. In response to concerns over U.S. industrial competitiveness, the Omnibus Trade and Competitiveness Act of 1988 added another requirement to the report—namely, an analysis of “equity of access by U.S. public and private entities to public (and publicly supported private) R&D opportunities and facilities in each country which is a major trading partner of the U.S.” This year’s report is the first to contain data on “symmetrical access”. Although President Bush’s letter of transmittal focuses on these issues, and the body of this report contains numerous references to them, the analysis of equity of access by U.S. public and private entities to our trading partners’ R&D opportunities and facilities suffers from a lack of continuity. It might be helpful for the reader to know that key references to IPR and symmetrical access appear in the following discussions:

In Chapter 1, under a policy section on “Trends in S&T Cooperation”, legislative language on symmetrical access to technological research (Section 5171 of the Omnibus Trade and Competitiveness Act of 1988) is printed.

Chapter 3, which covers selected U.S. bilateral relationships, discusses IPR negotiations, albeit inconsistently. For instance, there is a comprehensive update of the IPR problem in S&T negotiations with India, but there is no mention of the issue in the context of the U.S./Japan S&T agreement. Future editions of the report should cover these topics for each of our major trading partners.

Chapter 5 also contains a brief section on the Administration’s efforts at fulfilling section 5171 of the Trade Act.

Although acknowledging both the complexities involved in presenting a comprehensive assessment of IPR and symmetrical access in S&T agreements and the fact that this is a new requirement for the report, we would urge that future reports pay even closer attention to this provision.

We would also suggest that future reports take direction from the wise words of President Bush in the letter of transmittal:

The challenge facing us in the years ahead is how to maintain and expand an open, mutually beneficial world system of exchange and cooperation in science and technology without undercutting our national competitiveness or jeopardizing our security interests and responsibilities.

These words suggest a variety of topics, under-reported in the past, that should be addressed more fully in future reports:

1. How to increase international cooperation on scientific projects which are too large for any one nation to pursue (AIDS research, human genome mapping, energy research, high-energy physics facilities).

2. A discussion of how international S&T policy is established in the Administration, including a specific discussion of the role of the Department of State in formulating policy in the inter-agency process. For example, why is the State Department deeply involved in space station discussions, but uninvolved in discussions on the Superconducting Super Collider?

3. A comprehensive discussion of how the Administration is improving access to foreign S&T, as required by Executive Order 12591.

4. A discussion of the extent to which U.S. science and technology activities during the reporting year have helped promote objectives of the U.S. national interest in science and technology. Such a discussion would necessarily involve the implications of science and technology activities for U.S. foreign policy.

With greater attention to emerging issues such as these, and with continued dialogue between the Congress and the Administration, we are convinced that the Title V report will be an even more useful document in the years ahead for both policy-makers and students of policy.

The views expressed in this report, unless otherwise noted, are those of the Executive Branch and do not necessarily reflect the views of the Committee on Foreign Affairs or of the Committee on Science, Space, and Technology of the House of Representatives. The Committees commend the many executive branch personnel who contributed their time, data, and observations to this Title V report.

ROBERT A. ROE,
Chairman, Committee on Science, Space, and Technology.

DANTE B. FASCELL,
Chairman, Committee on Foreign Affairs.



LETTER OF TRANSMITTAL

THE WHITE HOUSE,
Washington, DC, April 15, 1989.

To the Congress of the United States:

In accordance with Title V of the Foreign Relations Authorization Act for Fiscal Year 1979 (Public Law 95-426), I am transmitting the annual report on international activities in science and technology (S&T) for Fiscal Year 1988.

I firmly believe that the economic advances of the 21st century are rooted in the research and development (R&D) performed in laboratories around the world today. Innovation and dedication of resources and people, both public and private, to scientific and technological advances are essential to economic progress. Our future well-being as a nation is dependent upon the continuous transfer of technology from basic science into commercial goods and services.

Over the past 5 years, this concept—the linkage of our science and technology enterprise to our future global competitiveness—has become a dominant theme in the United States. Because of this linkage, some have challenged our historical subscription to an open, unimpeded R&D system, claiming that such a system transfers valuable R&D results to other countries for commercialization and eventual sale in the United States. I, and President Reagan before me, believe that the United States benefits, and our global competitive position is improved, by international cooperation in research and development based on balance, reciprocity, and comparable access. We have actively promoted this policy through multilateral fora and bilaterally with our trading partners and advanced developing countries.

For example, a major accomplishment of FY 1988 was winning multilateral endorsement for key themes of President Reagan's Executive Order No. 12591 of April 10, 1987, on "Facilitating Access to Science and Technology." At the Ministerial Meeting of the Organization for Economic Cooperation and Development (OECD) in Paris in May 1988, the ministers endorsed a new framework of common principles for international S&T cooperation, originally introduced by the President's Science Adviser, Dr. William R. Graham. The framework endorses adequate investment and excellence in basic sciences; reciprocity and balanced access as a solid foundation for science and technology cooperation; improved universal protection of intellectual property rights (IPR); and effective protection of sensitive knowledge. I am convinced that the new OECD framework establishes a firm, future-oriented foundation for sustainable cooperation in science and technology.

On the bilateral front, under the guidance of the Economic Policy Council, the Administration developed a coordinated policy to reshape our S&T relationship with Japan based on the principles of shared responsibilities, equitable contributions, adequate protection and fair disposition of intellectual property rights, acknowledged security obligations, and comparable access to government-sponsored and -supported R&D facilities and programs. The culmination of this effort came in Toronto in June 1988, when President Reagan and Prime Minister Takeshita signed the new umbrella S&T Agreement. We view this as a model agreement and now are incorporating its principles into all our science and technology bilateral agreements.

Maintenance of our global competitiveness requires adequate and effective protection and equitable allocation of intellectual property rights. The commercial development of a new technology requires large investments of time, money, and talent. Continued investments in research and development require the ability to derive economic benefits from the new technology. Therefore, in FY 1988, we initiated numerous bilateral and multilateral dialogues on the benefits accruing to all partners from effective protection and equitable disposition of IPR.

With the view that balanced and reciprocal cooperation in S&T benefits the United States and the world at large, at the December 1987 Washington Summit, President Reagan and General Secretary Gorbachev agreed to further cooperation in the areas of transportation, global climate change, ocean studies, and nuclear reactor safety, as well as to continue a multilateral conceptual design effort in thermonuclear fusion. As a result, in April 1988, we signed a protocol with the Soviets on cooperation in maintaining the safety of civilian reactors. This agreement, which was stimulated by Chernobyl, covers the design and operation, health, environmental, and regulatory aspects of the reactor safety problem. In addition, in January 1989, we signed a U.S.-USSR Framework Agreement for Cooperation in Basic Scientific Research, which is serving as the model for other U.S.-USSR agreements to ensure policy consistency among all our extensive interactions with the Soviets in science and technology.

Sustainable international cooperation in science and technology is good for the Nation, particularly when projects that are in the national interest are enhanced by or intrinsically require multilateral effort. Examples are the Space Station Freedom, the superconducting Super Collider (SSC), AIDS research, and global climate change.

In December 1987, the Secretary of Energy invited our major allies to contribute to building the world's most advanced high-energy particle accelerator, the SSC, and to participate in its utilization. We now look forward to extensive collaboration in the project.

In September 1988, a final agreement was signed among the United States, member states of the European Space Agency (ESA), and the Governments of Japan and Canada on the Space Station Freedom's design, development, and operation.

AIDS is a major worldwide public health concern. The United States Government, particularly the Agency for International De-

velopment and the Public Health Service, is engaged in a substantial international program working with the World Health Organization and others to develop national plans to combat AIDS and to utilize research findings and technologies as they become available.

The policy question of human impact on the global environment in the past few years has moved out of the confines of scientific papers and conferences to become a front-page issue. Recent events, such as the 1985 discovery of the Antarctic "ozone hole" and the 1988 North American drought, have created much debate regarding the relative contributions of human-induced and natural processes on global climatic and environmental change. Bearing these concerns in mind, in April 1988, the United States ratified the Montreal Protocol on Substances that Deplete the Ozone Layer, which provides for reductions in production and consumption of principal ozone-depleting chemicals.

Significant uncertainties remain about the magnitude, timing, and regional impacts of global climate change. During FY 1988, the United States has made major contributions to international plans to reduce those uncertainties. The FCCSET Committee on Earth Sciences prepared a strategy for the U.S. Global Change Research Program, which I have endorsed. Prepared in close collaboration with other national and international planning groups and activities, the U.S. research strategy calls for an integrated approach in partnership with international organizations such as the World Meteorological Organization, the United Nations Environment Programme, and the International Council of Scientific Unions. The Intergovernmental Panel on Climate Change launched its multilateral effort in November 1988 with U.S. participation and support.

Believing that the R&D of today is the goods and services of tomorrow, and believing that further discoveries in superconductivity hold enormous potential for applications, President Reagan signed into law on November 19, 1988, the "National Superconductivity and Competitiveness Act of 1988," which establishes a framework for a national program in superconductivity. He also named a National Commission on Superconductivity to provide guidance over the long term, as the real benefits from superconductivity may take years or decades to fully realize. Our goal as a nation is to lead the world in superconductivity R&D and in translating this new technology into useful products.

Strong U.S. involvement in international S&T requires excellence in the administration and implementation of our S&T policies around the world. Therefore, in response to President Reagan's Executive Order No. 12591 of April 10, 1987, the Department of State has sought to strengthen the technical expertise of its S&T officer corps by intensified recruitment from United States Government technical agencies, academia, and industry, and has recently established a specific career track for S&T officers. In addition, the Department of State, in cooperation with the National Science Foundation and the Department of Commerce, initiated the S&T Reporting and Information Dissemination Enhancement Project (STRIDE) in order to improve international scientific reporting.

As President, I intend to continue to build on the solid foundation in science and technology laid by President Reagan and his Administration. I believe that sustainable cooperation in science

and technology is good for America and good for the world. Therefore, as the technology gap narrows, as internationalization of scientific and technological progress becomes the accepted norm, we must be concerned that the competitive drive for technological leadership not lead to protectionism in science, even as we are removing barriers to free and open trade. The challenge facing us in the years ahead is how to maintain and expand an open, mutually beneficial world system of exchange and cooperation in science and technology without undercutting our national competitiveness or jeopardizing our security interests and responsibilities. Articulating and responding to that challenge is a high priority of my Administration.

GEORGE BUSH.

THE WHITE HOUSE, *April 15, 1989.*

EXECUTIVE SUMMARY

Chapter 1: THE ROLE OF INTERNATIONAL SCIENCE AND TECHNOLOGY--POLICY OVERVIEW. The Administration's international science and technology policy served five primary objectives during FY 1988. These objectives include strengthening the nation's scientific and technological enterprise; advancing the nation's competitiveness and economic strength; promoting U.S. foreign policy goals and improve international relations; enhancing commercial relations; and protecting and, where possible, enhancing national security. Chapter 1 describes the ways in which international science and technology activities during FY 1988 of the U.S. government and its various technical agencies have contributed to the goals set forth in these objectives. The chapter also notes the trends in international science and technology cooperation during FY 1988. The Administration continued to negotiate more sharply focused bilateral and multilateral cooperative agreements, and to define a better balance of benefits to the participants.

Chapter 2: INTERNATIONAL SCIENCE AND TECHNOLOGY ACTIVITIES OF U.S. GOVERNMENT AGENCIES. Chapter 2 is an overview of the international scientific and technological (S&T) activities of U.S. government agencies during FY 1988. At least 20 federal agencies are involved in over 600 formal S&T agreements with approximately 120 countries, and this cooperation produces data and results that are important in achieving U.S. foreign policy objectives as well as the domestic goals of the various Departments.

Department of State. The Secretary of State has primary responsibility for coordination and oversight of major science and technology agreements and activities between the U.S. and foreign countries. The Department of State exercises its responsibility in coordination with other U.S. government departments and agencies. Implementation of the S&T responsibility involved nearly 200 domestic and foreign employees during FY 1988. The Department of State has 34 full-time S&T officers at its embassies, 17 of whom have scientific or engineering degrees, and an additional 21 officers who spend at least 20 percent of their time performing S&T activities. The Bureau of Oceans and International Environmental and Scientific Affairs (OES) during FY 1988 has been engaged in negotiations on S&T agreements with Japan, Korea, the Soviet Union, and many other countries; has actively recruited S&T officers from other agencies and academia; and has implemented the STRIDE project for wider dissemination of departmental S&T reporting in response to E.O. 12591.

U.S. Agency for International Development (USAID). During FY 1988, USAID continued its assistance to developing countries throughout the world by conducting and/or funding applied and developmental projects that meet the basic needs of the recipient country. Major areas of activity during FY 1988 are reviewed in Chapter 2. These areas include agriculture (animal husbandry and crop development), energy, forests, natural resources, health, nutrition, rural development, institutional development, and population. USAID also operates several grant programs with the goal of applying new developments in science to the problems of less developed countries. For example, the Program in Science and Technology Cooperation awarded 57 new grants in FY 1988 totaling over \$8 million.

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Department of Agriculture (USDA). USDA continued to conduct agricultural research projects and participated in scientific and technical exchanges during FY 1988. In addition, a number of USDA employees are on loan to and cooperate with other agencies such as USAID and the UN Food and Agriculture Organization. In fiscal terms, the largest USDA activity during FY 1988 was with Mexico to control the damage caused by the screw worm. USDA also supports a variety of international conferences.

Department of Commerce (DOC). The Department of Commerce and constituent offices and agencies engage in a wide variety of S&T activities in response to its mission of improving international trade and promoting U.S. economic growth and technological advancement. The Office of the Assistant Secretary for Productivity, Technology and Innovation is comprised of several elements that are responsible for developing policies and procedures to enhance U.S. competitiveness, in part through the collection and dissemination of scientific and technological reports. The Office of Japanese Technical Literature within the Commerce Department also assists in the collection and translation of technical reports. The Bureau of the Census, International Trade Administration, National Oceanographic and Atmospheric Administration (NOAA), National Institute of Standards and Technology (NIST, formerly National Bureau of Standards), National Telecommunications and Information Agency (NTIA), National Technical Information Service (NTIS) and Patent and Trademark Office also participate in international S&T cooperation at varying levels of activity. NOAA and NIST routinely participate in S&T projects under government-to-government umbrella S&T agreements, as well as having many Memoranda of Understanding independently with foreign counterparts.

Department of Defense (DOD). The Department of Defense seeks to enhance the security of the U.S. and the free world through promoting international defense science and technology cooperation among allies and other friendly nations while at the same time protecting militarily-critical technology. This effort involves the integration of scientific and technological advances into U.S. military capabilities. Through sustained cooperation in research and development, the U.S. improves the effectiveness of its own defenses, increases mutual compatibility of military forces, and strengthens alliances. The U.S. also continues to encourage countries to field advanced military capabilities and to establish or strengthen technology security programs in order to deter the uncontrolled flow of free world technology to the Soviet bloc, hostile countries and terrorist organizations. DOD continued to play a lead role in the developing Strategic Defense Initiative (SDI). A table within this section of the report presents a list of contracts and major subcontracts awarded prior to the end of FY 1988.

Department of Energy (DOE). The international research and development programs of DOE provide direct support to energy security goals and objectives. International cooperation in areas concerned with energy may include exchanging information, sharing costs, broadening the intellectual base, reducing unnecessary and inefficient duplication of facilities, and fostering international commerce. DOE expanded its bilateral activities during the fiscal year by entering into 13 new agreements and annexes.

Environmental Protection Agency (EPA). Public concern over the environment and its effects on human health continued during FY 1988. The EPA participates in a number of bilateral

and multilateral activities in the areas of environmental change, environmental protection and environmental health. Major environmental programs involve cooperation with Canada and Mexico in solving a wide range of transboundary pollution issues, and several significant agreements in this area were signed during FY 1988. The EPA also took steps during FY 1988 to help manage the transboundary movement of hazardous waste throughout the world. Bilateral cooperation during FY 1988 also was actively pursued with counterpart organizations in Germany, the Netherlands, Japan, the Soviet Union, and other countries.

Department of Health and Human Services (DHHS).

Involvement of the Public Health Service (PHS) in international activities enhances its mission of protecting and promoting the health of the American people. PHS bilateral agreements are aimed at fulfilling that goal and at providing mutual benefit to partner countries. Important advances in the biomedical sciences frequently have been based on the work of scientists from many countries, each of whom provides significant contributions to the discoveries. Communications and exchange of experts, biologists, data and research findings promote scientific achievement, conserve scarce resources, and reduce duplication of effort. PHS bilateral programs focus on mutually beneficial objectives, particularly in countries such as India, China, and the Soviet Union.

Department of Interior (DOI). Elements within DOI are involved in international S&T cooperation in order to enhance their overall mission. The Fish and Wildlife Service (FWS) is involved in a wide range of international activities in support of its responsibilities under the Endangered Species Act, the Convention on International Trade in Endangered Species, the Convention on Wetlands of International Importance, and other statutory and treaty obligations related to the maintenance of biologic diversity. The FWS also is the implementing agency for the Western Hemisphere Convention for Protection of Nature and Wildlife Preservation. The U.S. Geological Survey (USGS) conducts international S&T activities in order to provide opportunities for comparative studies, acquisition of data, broadening the knowledge of the USGS staff, developing and maintaining relations with foreign counterparts, and supporting U.S. foreign policy objectives. The USGS has been active in technical assistance programs, the International Strategic Minerals Inventory, the World Energy Resource Program, and a variety of short-term projects and programs such as a new program in marine geology with Norway.

National Aeronautics and Space Administration (NASA). NASA continues to conduct an extensive program of international cooperation implemented for technical, scientific, economic, and political benefits to the U.S., and particularly to NASA's scientific goals. NASA continued to progress toward the design and development phase of the space station program working closely with its international partners. Under the Agreement between the U.S. and USSR Concerning the Exploration and Use of Outer Space for Peaceful Purposes, four of the five joint working groups met during FY 1988. NASA also continued its contributions to global climate studies, the International Space Year, the Interagency Consultative Support Group for Space Science, and the San Marco D/L launch.

National Science Foundation (NSF). The NSF continues to play an important role in U.S. international cooperation in science and technology. The Foundation fosters U.S. knowledge of scientific and engineering developments in foreign countries, initiates and supports international cooperation, provides opportunities for scientific collaboration in developing countries, and supports U.S. institutions doing

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research abroad. Approximately 20 percent of the 12,000 grants awarded by the NSF during FY 1988 had an international component. NSF international activities have been attentive to the need for improved U.S. economic competitiveness and have emphasized comparable access in implementing international exchanges. Successful negotiations with the Japanese are expected to allow better access to Japan's academic, government, and industrial research facilities for U.S. scientists and engineers. In other bilateral activities during FY 1988, the NSF announced an initiative to support new international cooperation with the French in computer science, engineering, and mathematics. NSF also initiated or expanded bilateral activities with western European countries, Latin America, Pacific Rim countries, and India.

Nuclear Regulatory Commission (NRC). The NRC has formal information exchange agreements with 23 counterpart agencies in 22 countries. These agreements provide formal channels of communication with foreign nuclear regulatory organizations and assure prompt notification in instances of nuclear safety problems. Agreements with Italy, Belgium, and Israel were renewed during the fiscal year. The NRC also is involved in over 55 research agreements with foreign counterparts in over 20 countries dealing with nuclear safety.

Department of Transportation (DOT). The DOT objectives for carrying out international S&T cooperation are: to collaborate to solve common technical and operational problems while avoiding duplication of national efforts, to coordinate national positions in international organizations, to promote the sale of U.S. transportation equipment and technology, and to support U.S. foreign policy. The DOT cooperates with other countries to accomplish national transport goals, such as the development, improvement and interfacing of air and sea operations. DOT has S&T bilateral cooperation arrangements with 24 countries, actively participates in 15 international organizations and is involved from time to time in the work of other multilateral groups. In addition, during FY 1988, DOT also (a) provided cost-reimbursable aviation and highway technical assistance to 67 countries; (b) conducted a large foreign visitor program for technical orientation, general fact-finding, and/or discussions on policy issues; and (c) provided aviation, highway, maritime, and merchant marine training to 490 foreign students. Major activities producing significant benefits were carried out with Canada, China, France, Germany, and The Netherlands. Plans were made to resume cooperation with the Soviet Union and Poland. DOT staff continued work with other countries in international organizations; e.g., the European Conference of Ministers of Transport, the Inland Transport Committee of the Economic Commission for Europe, the International Maritime Organization, the International Civil Aviation Organization, the Road Research Program of the Organization for Economic Cooperation and Development, and several other special highway and rail international groups.

Chapter 3: BILATERAL SCIENCE AND TECHNOLOGY COOPERATION. Chapter 3 presents reports on bilateral S&T cooperation in selected countries. These activities refer to issues of global significance as well as to the steps taken through various agreements to address specific national concerns. For example, energy agencies in the U.S. and Canada last year increased participation in energy research and development and in cooperative fusion energy research. The two countries upgraded standards for automobile emissions to be consistent with U.S. domestic standards. Among the controversial issues remaining between the two countries is the problem of acid rain which is now being addressed jointly by American and Canadian environmental protection agencies. FY 1988 also marked the

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tenth anniversary of government-to-government cooperation in science and technology with China. The activities between the two countries have expanded remarkably to 29 protocols, with interest for more agreements being expressed recently by NASA, the Bureau of Mines, and the Center for Disease Control (HHS). The yearly bilateral interchange of scientists, engineers, and students numbers in the thousands, including research sessions, seminars, and publications of discoveries in new areas which benefit both countries. This country's extensive S&T relationship with Japan was put on a new footing during FY 1988, with the signing in June by President Reagan and Prime Minister Takeshita of a new umbrella agreement on cooperation in research and development in science and technology. In addition, after five years of negotiations, the U.S. and Japan signed an agreement on peaceful uses of nuclear energy.

Chapter 4: UNITED STATES PARTICIPATION IN THE SCIENTIFIC AND TECHNOLOGICAL ACTIVITIES OF INTERNATIONAL ORGANIZATIONS. The U.S. has participated with a number of multilateral science institutions whose interests range from global issues to specific problems of interest to individual countries. For example, the scope of issues encompasses the work of the U.N. Committee on Peaceful Uses of Outer Space (COPUS), which was established by the U.N. General Assembly in 1958, and the NATO Science Committee which has a special program under the Science for Stability Organization and has assisted Greece, Portugal, and Turkey in developing their S&T capabilities. The U.S. contributions to selected international organizations, such as the Food and Agricultural Organization, the International Civil Aviation Organization, and the International Telecommunications Union are presented in tabular form in this chapter.

Chapter 5: SELECTED TOPICS IN INTERNATIONAL SCIENCE AND TECHNOLOGY. During FY 1988, a host of meetings were held to discuss health, climate, nuclear, safety, intellectual property rights, and many other issues. Reviews of the most important topics are in Chapter 5. The efforts of the Presidential Science Advisor Dr. Graham resulted in member states of the OECD establishing a framework for international cooperation in science and technology. Among the most worrisome issues of the fiscal year was the increased number of cases of acquired immune deficiency syndrome (AIDS) in all segments of society worldwide. The concern has prompted scientists and researchers to turn more attention and energy to finding a cure for the disease. To this end, millions of dollars have been channeled to agencies such as the World Health Organization Global Program on AIDS for further study of the problem. The Fourth International Conference on AIDS, held at Stockholm last June, was one of many seminars and workshops held in various parts of the world. Another issue which has received great attention by scientists and the general public is potential global climate change. Both its short-range and long-range effects are being studied. Similarly, the concerns about protection of the ozone layer have prompted officials worldwide to review ways to research, monitor, and exchange information to deal with this global issue.

Appendices. Several appendices accompany the text portion of this report. Appendix I and Appendix II present the same material of S&T agreements except that Appendix I is arranged by country participating with the U.S., and Appendix II is arranged by the U.S. agency responsible for the cooperative activity. Appendices III and IV present funding information for USAID according to country and program.

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CHAPTER 1: THE ROLE OF INTERNATIONAL SCIENCE AND TECHNOLOGY--POLICY OVERVIEW

The Administration's international science and technology policy continues to serve five primary objectives: (1) to strengthen the nation's scientific and technological enterprise; (2) to advance the nation's competitiveness and economic strength; (3) to promote U.S. foreign policy goals and improve international relations; (4) to enhance commercial relations and establish new trading partnerships; and (5) to protect and, where possible, to enhance national security. These objectives were set forth and discussed in earlier editions of the Title V report. This chapter discusses progress achieved during FY 1988 toward these objectives and describes trends in international S&T cooperation noted during the year.

Strengthening the Nation's S&T Enterprise

U.S. Government agencies are committed to an array of international S&T programs and activities having as their ultimate objective the strengthening of the nation's capabilities in various disciplines. As evidenced by the narratives in this 9th edition of the Title V report, and by the data base presented in its appendices, the U.S. has entered into government-to-government and agency-to-agency agreements with countries at various stages of economic development, for purposes directly related to carrying out Congressional mandates and for accomplishing the missions of the respective agencies.

An important characteristic of most of these international programs is that they must be justified and funded by the participating technical agencies in terms of what are essentially scientific and technical objectives. This criterion contributes compellingly to the winnowing process in project selection and to the pursuit of top quality scientific results in project implementation, as scarce resources must be prudently allocated by each agency.

Exemplifying the importance of the Administration's commitment to strengthening the nation's S&T enterprise through international S&T cooperation were the negotiations conducted throughout FY 1988 with Canada, Japan and the member countries of the European Space Agency for the design, construction, operation and utilization of the Space Station. Other examples of efforts to strengthen the U.S. S&T enterprise through international cooperation may be found, *inter alia*, in transportation technologies, fusion and other energy research programs, nuclear safety, biotechnology and vaccine research, and oceanography.

Advancing the Nation's Competitiveness and Economic Strength

The President's Competitiveness Initiative, manifested in part in Executive Order 12591 on Facilitating Access to Science and Technology, issued April 10, 1987, constitutes a package of measures designed to enhance U.S. responses to global challenges, to raise the level of the nation's R&D effort, and to encourage centers of excellence. Among other measures, the Executive Order directs federal agencies embarking on international cooperative R&D agreements to consider the issues of reciprocity of access to facilities, protection for intellectual property rights, and control over transfer of strategic technology. To improve access to foreign scientific and technological developments, the Order instructs the Departments of State and Commerce and the National Science Foundation to develop a mechanism for the efficient distribution of foreign S&T information, and directs the State Department to recruit scientists from other agencies in filling assignments in U.S. embassies abroad.

During FY 1988, the Administration intensified its efforts to emphasize U.S. views concerning equity and reciprocity of access to research and training facilities, experimental sites, scientific data and other R&D results. Among the U.S. goals in negotiating bilateral S&T agreements during 1988, was incorporation of specific assurances that intellectual property rights would be protected. U.S. negotiators have been consistently pursuing such provisions, important to creating favorable investment climates and fostering development and application of new technologies through international cooperation.

Supporting Foreign Policy Goals and Improving International Relations

Bilateral cooperative agreements in science and technology, like many of the multilateral S&T undertakings, play an important role in achieving broad foreign policy objectives. As described in greater detail under the various country and topical headings of this report and in the appendices, S&T exchanges with countries having differing socio-economic systems serve: (1) to advance U.S. science and technology by promoting cooperative scientific research between individual scientists of the partner countries in areas of mutual interest and expertise; (2) to support foreign policy initiatives and objectives of the U.S. by developing and implementing high-quality cooperative research programs conducted on the basis of equality, reciprocity and mutual benefit; and (3) to improve access to the S&T elites of the participating foreign country.

The U.S. technical and foreign affairs agencies possess a huge but limited repertoire of talents and tools for addressing specific S&T problems and opportunities. These resources are made available to address the needs of the Third World through U.S. foreign assistance programs in S&T for development. Project ingredients are combined in many ways, drawing on diverse agencies, including the Departments of Agriculture and Energy, the U.S. Geological Survey (USGS), the Fish and Wildlife Service, the Department of the Army and its Corps of Engineers, the Environmental Protection Agency (EPA), the Public Health Service, and the National Oceanic and Atmospheric Administration (NOAA). Funded in many cases by the Agency for International Development and its Bureau of Science and Technology for Development, vital programs are being carried out throughout the African continent, and in dozens of other countries in Asia and the western hemisphere. Among the largest AID-sponsored S&T country programs are those in India, Thailand, and Egypt.

Cooperative S&T undertakings also are proving extremely useful in expanding U.S. contacts and improving communications with important elements of society in countries as different as Malaysia, Yugoslavia, Chile and Indonesia. S&T exchanges are a versatile and useful mechanism in support of various foreign policy objectives adapted to our specific program goals in individual partner countries.

Politically sensitive S&T issues, notably in the area of environmental concerns, particularly affect U.S. relations with Canada and Mexico. They include the issue of acid rain with Canada, described elsewhere in this report, pollution of the Niagara River, transboundary movements of hazardous waste, and serious problems of transboundary environmental quality along the U.S.-Mexico border. Significant progress was made on these issues in FY 1988.

Another difficult foreign policy problem was successfully addressed in FY 1988 when the U.S. and 15 South Pacific island countries signed the South Pacific Regional Fisheries Agreement. It provides access to South Pacific fisheries for the U.S. tuna fishing fleet and resolves a longstanding problem stemming from different juridical positions on highly migratory tuna species.

Considerable progress was made in FY 1988, for example, in implementing and renewing the Presidential Science and Technology initiative with India. The political significance of extensive and still expanding S&T relations between the U.S. and China has been described in previous editions of this report. More recently, S&T relations with Poland and the USSR gained momentum in 1988. In FY 1988, the Administration developed a coordinated U.S. Government policy to reshape our S&T relationship with Japan. The result was the June 20 signing of a new head-of-government agreement. A regional program, funded largely by the Agency for International Development (USAID) and employing S&T projects to achieve development objectives, involves Israeli and Egyptian scientists in cooperative research.

The Administration also pursued its foreign policy goals multilaterally. At the May 1988 Ministerial meeting of the Organization for Economic Cooperation and Development (OECD), the Ministers endorsed a new framework of common principles for international S&T cooperation. In essence, the framework recognizes that certain elements are central to preserving and maintaining a vibrant international S&T system.

Enhancing Commercial Relations and Establishing New Trading Partnerships

One of the most important aspects of the Administration's international S&T policy and its implementation during FY 1988 has been an intensive effort to improve the technological competitiveness and global market access of U.S. industry. This effort embraces protection of intellectual property rights and extends to numerous other steps undertaken in bilateral, as well as multilateral, contexts.

U.S. concern with regard to adequate protection of intellectual property rights has grown since 1980, in the contexts of both trade policy and S&T policy. This concern is a natural outgrowth of several legislative actions designed to make better use of research performed in government laboratories or under government contracts. It is a concern addressed in Executive Order 12591 and the Trade and Competitiveness Act of 1988.

Examples of ways in which S&T exchanges can benefit U.S. exporters and other U.S. firms can be found wherever state-of-the-art technologies are involved in projects and activities. In some cases, the exchanges promote the sale of U.S. research instrumentation, medical equipment and data processing facilities. Major efforts have been undertaken in telecommunications negotiations to create conditions for the free flow of electronic data across international borders, and there are significant commercial aspects to the Space Station program.

Protecting and Enhancing National Security

The U.S. seeks to enhance the security of the free world by promoting defense S&T cooperation with allies and other

friendly nations while at the same time protecting militarily-critical technology from diversion to potential adversaries. Through sustained cooperation in technology and development, the U.S. improves the effectiveness of its own defenses, increases mutual compatibility of military forces, and strengthens alliances.

Section 1103 of Public Law 99-145 (Nunn Amendment to the FY 1986 Defense Authorization Act) provides funding for the U.S. government to engage in a wide variety of cooperative research and development programs with NATO allies. Over 80 multilateral and bilateral programs are in various stages of negotiation. Similar efforts are underway with numerous non-NATO allies, including Japan, Israel, Egypt, Korea and Australia.

The President's Strategic Defense Initiative (SDI) is an important effort to explore a safer and more stable way to keep the peace than the threat of retaliatory attacks on our adversaries.

In March 1985, the U.S. invited 18 nations to participate in the SDI program so that the SDI and western security as a whole could be strengthened by taking advantage of allied excellence in relevant research and development areas. Allied participation in SDI--brought about through technical merit and rigorous competition--is of great benefit to the U.S. as well as to the participating nations. It allows the U.S. to accomplish SDI objectives as quickly as possible with work of the highest quality at the lowest possible cost. Pursuant to our invitation, the U.S. has signed MOUs on participation in SDI cooperation with the United Kingdom (December 1985), the Federal Republic of Germany (March 1986), Israel (May 1986), Italy (September 1986) and Japan (July 1987).

Trends in Science and Technology Cooperation

A trend characteristic of FY 1988 was the consistent and increasingly successful effort made by the Administration to negotiate more sharply focused bilateral and multilateral S&T cooperation agreements containing better balanced benefits to the participating partners. These permit greater access by U.S. researchers to foreign centers of S&T excellence, and reflect more accurately the highest R&D priorities of both the U.S. and its partners. This trend is expected to continue, with the negotiating approach finding widespread application as additional agreements come up for renewal.

Growing international concern about the dimensions and devastating effects of the acquired immune deficiency syndrome led during 1988 to intensification of the worldwide effort to understand, control and, if possible, cure it. The AIDS pandemic is, like a number of other topical key issues of FY 1988, discussed in Chapter 5 of this report.

The year 1988 also saw significant international efforts to address critical conservation issues, including those involving tropical forests, the environmental impacts of projects funded by multilateral development banks, and various other problems of endangered species of flora and fauna. After a decade of negotiations, for example, agreement was finally reached with Canada for the protection of the Porcupine River caribou herd.

Section 5171 of the Omnibus Trade and Competitiveness Act of 1988 on symmetrical access to technological research amends Section 502 of the Foreign Relations Authorization Act, FY 1979

(22 U.S.C. 2656B) to add a new paragraph five. With this paragraph, Congress declares it to be the policy of the United States that "(5) Federally supported international science and technology agreements should be negotiated to ensure that (a) intellectual property rights are protected; and (b) access to research and development opportunities and facilities, and the flow of scientific and technological information are, to the maximum extent practicable, equitable and reciprocal."

The act also amends Section 503(B) of the 1979 Foreign Relations Authorization Act (22 U.S.C. 2656C(B)) by adding a new paragraph three requiring that the President's annual report to the Congress on science, technology and American diplomacy (the Title V report) contain information and recommendations with respect to "(3) equity of access by United States public and private entities to public (and publicly supported private) research and development opportunities and facilities in each country which is a major trading partner of the United States."

The act further amends Section 503 of the 1979 Foreign relations authorization Act by adding a new subsection providing that "(D) (1) the information and recommendations developed under subsection (B) (3) shall be made available to the United States trade representative for use in his consultations with federal agencies pursuant to executive orders pertaining to the transfer of science and technology." (Comment. Reference to this subsection to executive orders pertaining to the transfer of science and technology thus includes Executive Order 12591 of April 10, 1987 (52 F.R. 13414), on "facilitating access to science and technology.")

The conference report on these amendments provides the following background:

United States science and technology policy has traditionally encouraged international access to this nation's public research and development activities and opportunities. The conference agreement is an attempt to encourage other countries to follow the United States example.

Current law (the Stevenson-Wydler Technology Innovation Act of 1980) and Executive Order (Number 12591, issued in April 1987) set the precedent for this section of the conference agreement. Both direct federal laboratories and agencies, in international science and technology negotiations, to consider whether the home countries of foreigners who apply for access to U.S. research and development facilities, offer comparable terms to U.S. nationals.

The conference agreement makes several amendments to Title V of P.L. 95-426 (22 U.S.C. 2656) to ensure that science and technology agreements involving the United States open up foreign research and development activities and opportunities for Americans. The amendments build on existing goals of U.S. international science and technology policy, provide for more information on the United States' access to foreign research and development activities and opportunities, and establish a process to review proposed U.S. international science and technology agreements.

Section 5171 (A) of the conference agreement adds to the declaration of policy in Title V. It states that U.S. federally supported international science and technology agreements should be negotiated to assure proper protection of intellectual property rights to the maximum extent possible and reciprocal and equitable access to foreign scientific and technological opportunities, facilities and information. The

conferees recognize that strict reciprocity may not be a proper measure for ensuring the optimal amount of access inasmuch as the structure and organization of the U.S. scientific and technological enterprise may not mirror that of other nations. For this reason, the conferees encourage policy makers to evaluate the equity and reciprocity of the overall science and technology relationship when measuring and ensuring such access.

The Department of Commerce collects information for the United States Trade Representative (USTR) to identify cases in which the researchers of American companies have been denied access to foreign government supported research and development facilities.

In directing that information on such access be included in the Title V annual report, the conferees intend that such information be readily available to federal agencies and the Congress for use in the implementation and oversight of relevant laws and executive orders governing U.S. access to foreign science and technology facilities and activities.

CHAPTER 2: INTERNATIONAL SCIENCE AND TECHNOLOGY ACTIVITIES OF U.S. GOVERNMENT AGENCIES

DEPARTMENT OF STATE

The Secretary of State has primary responsibility for coordination and oversight of major science and technology agreements between the U.S. and foreign governments. This responsibility is exercised in coordination with other U.S. government departments and agencies.

To implement its responsibilities, the State Department had nearly 200 personnel employed in the U.S. and abroad during FY 1988. These individuals worked to achieve American science and technology goals, economic growth, and foreign policy objectives. Successes included the conclusion of an agreement between the United States, Japan, Canada and nine western European nations concerning long-term cooperation in the development, operation and utilization of the manned space station. The largest international cooperative science and technology project in history, the space station will strengthen relations with our allies and may establish a powerful model for cooperation in other space projects. The Department of State also has responsibility for leading the negotiations of government-to-government science and technology agreements. In FY 1988, this included the U.S.-Japan S&T agreement that was signed by President Reagan and Prime Minister Takeshita at the Toronto Summit in June 1988. The Department of State also led the negotiations on the U.S.-USSR Agreement on Basic Scientific Research in FY 1988.

The Department of State continued to play a leading role in environmental issues. Assistant Secretary of the Bureau of Oceans and International Environmental and Scientific Affairs (OES) Dr. Frederick M. Bernthal led the U.S. delegations to the London Dumping Convention and the first meeting of the Intergovernmental Panel on climate change. The State Department was active in concluding the NOx Protocol which is appended to the long-range transboundary air pollution agreement. The protocol is the means by which Canada and other members of the U.N. Economic Commission for Europe agreed to control emissions of nitrogen oxides. The U.S. role also was seen in negotiations under the OECD and the U.N. Environment Program on transboundary movements of hazardous wastes.

A departmental review of S&T officer functions revealed four major areas of responsibility: (1) advising on policy issues; (2) representing U.S. government, including domestic agency interests; (3) negotiating with host governments; and (4) reporting on S&T developments. The multi-faceted nature of S&T work requires capable officers with diversified skills including an ability to place science and technology appropriately in the overall context of bilateral relations. As of September 30, 1988, 37 full-time S&T officers were assigned to embassies and missions abroad. Seventeen held scientific or engineering degrees of whom ten had advanced degrees. A number of these were recruited from other agencies, industry or academia.

Training for S&T officers during the fiscal year included a formal course at the Foreign Service Institute (FSI), carefully organized programs for officers on consultations, and an S&T officers conference. The two-week-long FSI course, developed with the assistance of the National Science Foundation, provided 25 State Department and domestic agency personnel with a detailed overview of the wide range of issues and interests at the intersection of science, technology and foreign policy as viewed by representatives of industry, academia, and the executive and legislative branches of government.

An intensive three-day conference in September 1988 provided 26 senior S&T officers with background information and guidance on a broad range of subjects including S&T issues and priorities, technology transfer, intellectual property rights and competitiveness, S&T reporting requirements, and environmental and energy issues. The importance of the conference, and of international science and technology, was emphasized by the level of speakers. These included the Deputy Secretary of State, the President's Science Advisor, and the Director of the National Science Foundation. The conference ended by meeting with the Chairman and members of the House Committee on Science, Space and Technology. Assistant Secretary Bernthal gave a report on the steps the Department of State is taking to implement E.O. 12591, "Facilitating Access to Science and Technology," issued April 10, 1987 and to assure that access to S&T abroad is equitable and reciprocal.

One element in responding to E.O. 12591 was the initiation of the STRIDE (S&T Reporting and Information Dissemination Enhancement) project. The Department of State, in cooperation with the National Science Foundation and the National Technical Information Service, conducted a pilot study during FY 1988 to gather and disseminate to U.S. industry and academia information on foreign science and technology. Selected embassies were asked to submit reports on superconductivity, advanced ceramics, advanced microelectronics, and other specifically appropriate subjects. These STRIDE reports then were sent to selected U.S. scientists, commercial S&T information managers, and industrial marketing experts.

OES now has continuing responsibility for gathering appropriate unclassified foreign S&T information from State Department sources, and providing it electronically to NSF and the National Technical Information Service (NTIS) for further dissemination. NTIS prepares abstracts of the STRIDE reports and makes the material commercially available through its established mechanisms to its customers.

During FY 1988, the OES Bureau underwent several important changes. First, Dr. Bernthal was sworn in as Assistant Secretary on May 24, 1988, succeeding John D. Negroponte. Dr. Bernthal has consolidated several offices within the Bureau in response to budgetary reductions at the Department of State. A current major objective of the Bureau is to modernize its electronic office equipment and telecommunications capabilities. The goals and activities of the OES Advisory Committee, a panel of nationally and internationally recognized scientists, have been re-examined and the committee is expected to assume a more active role in advising OES of current scientific and technological issues.

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

Previous editions of the Title V report have included discussion of the 1981 restructuring of the Agency for International Development (USAID) in order to strengthen its scientific and technical components. These policy and programmatic enhancements resulted in significant new initiatives and achievements.

Agriculture

Agricultural research is critical for successful village-level agriculture development to occur. Progress in development and extension begins with research, which in some cases must be undertaken several years before on-farm use is

safe and possible (e.g., germplasm, new breeding varieties and ecologically-sound pesticides). Thus, agricultural development milestones must be related to early research on new farm practices and technologies which can generate income, add to food supplies, and conserve natural resources in the process.

Water Management. USAID-funded irrigation projects have resulted in more reliable irrigation systems operation and management. Specific benefits realized are: (1) more acres can now be irrigated and more farmers benefit from the same amount of available water; (2) more uniform production with less year-to-year fluctuation; (3) reduced soil salinity and water logging, benefitting both immediate production and the number of families served, with better long-term sustainability; and (4) increased employment income and a more satisfactory economic return on public investments in irrigation.

Small Ruminant CRSP. Dual-purpose goats (DPG), used for meat and milk, have been developed by the Small Ruminant Collaborative Research Support System (CRSP) and continue to be in great demand by Kenyan farmers because of the high milking capability of these goats. Average daily milk off-take per DPG doe was 1.5 liters compared to off-take of indigenous breeds of only 0.5 liters. Basic research in genetics of sheep and goats resulted in marked increases in carcass meat and wool production. Indonesian sheep and goat weight gains were increased by 120 percent and efficiency by more than 80 percent, as a result of improved green legume foliage practices. Successful diagnosis of sheep pulmonary adenomatosis in Peru is considered a technological breakthrough.

Improved Nitrogen Fixing Organisms. Worldwide awareness, and more general acceptance, of biological nitrogen produced by legumes in association with the bacteria rhizobia has resulted, in part, from the work of USAID's projects. Biological nitrogen also has been shown to increase the efficiency of protein production by legume crops and to provide an inexpensive source of nitrogen as an alternative to commercial inorganic nitrogen fertilizers. Yields of common beans were doubled in experiments conducted in a few Central American countries when new bean varieties were combined with improved rhizobia. This has demonstrated the development and use of small scale, cost effective units to produce rhizobia in Asia and Africa. When legumes are inoculated with suitable rhizobia, it not only benefits the legume crops but also the future crops grown on the acreage.

Biological Nitrogen Fixation. University of Wisconsin researchers, working under the Bean/Cowpea CRSP, have developed dry bean lines that fix 80 kilograms nitrogen per hectare. The combination of superior cultivars and improved strains of rhizobia increases yields 50 to 70 percent. Using these improved strains makes it possible for farmers to maximize nitrogen supply at very little expense. Researchers have conducted regional and local trials on elite bean lines, testing for superior fixation potential and other desirable traits. Several black bean breeding lines have performed well and soon will be released. Seeds with enhanced capability for nitrogen fixation are being made available as new cultivars for planting, or for use in breeding programs in the U.S., at International Agricultural Research Centers (IARCs) and in other national programs.

Tropical Soils. Technology to manage highly-weathered, infertile tropical soils has been developed and has contributed to meeting worldwide hunger and food needs. For example, sorghum yields have been increased from 56 to 120 percent in three agroclimatic regions of Niger with sandy soils. Texas A&M

University investigators developed a contour strip rainfall harvesting (CSRH) technique to induce a deeper rooting system and dramatically increase dry matter production. In addition, cropping cycles, after slash and burn farming, have been increased from two or three crops to five or six by systematic return of residues, selection of acid tolerant varieties and crop rotation. This increase in number of cropping cycles and intensified management of appropriate lands saves approximately seven to ten acres of primary forest for every acre so treated.

Wheat Breeding Program. Oregon State University has developed numerous wheat lines with superior qualities by crossing spring wheat with winter wheat. When compared to local check cultivars in 39 countries, selections from the winter/spring program consistently have higher yields. Several lines which originated from the project are in the final stages of testing for release in Oregon, and two varieties selected from project material were released to Tunisia during 1988. The researcher who developed these new wheat varieties received an award from the USDA for his outstanding work.

Soybean Utilization. Soybean utilization increasingly is providing income for the rural poor. By learning how to process soybeans, less developed country (LDC) producers can make and sell a nutritious product made with low quality, locally produced commodities and with nominal input from the outside. For example, soybean food production suited to local Sri Lankan tastes, including flour, milk and weaning food, has been assisted by the International Soybean Program (INSOY) based at the University of Illinois. Improved harvesting of immature pods and bean removal for canning and freezing of whole soybeans have been studied for foreign and domestic markets. Residue conversion research has been undertaken to achieve affordable, high quality animal food from extrusion cooking. A small scale extruder-exPELLer process has been developed with the objective of product sterilization without destruction of important nutrients such as protein.

Peanut CRSP. The Peanut CRSP released peanut varieties that are high yielding, tolerant to pests and drought and suitable to fit into agriculture systems of developing countries. Plant breeding efforts of the Peanut CRSP resulted in the release of seven superior cultivars including one in the Philippines, one in Jamaica and two in Thailand. Three peanut varieties were released for commercial use by the Peanut CRSP scientists in North Carolina due to the feedback of superior germplasm to U.S. clientele and enhanced U.S. peanut breeding programs. Advanced testing of several more varieties promises similar results in Texas.

International Agricultural Research Centers. USAID contributes approximately 20 percent of the core funding of a global network of multi-donor-financed international agricultural research centers. These centers are devoted to solving problems that limit the productivity of agriculture in developing countries, training developing country agriculture scientists, and transferring technologies to individual countries. Center scientists address both technical and socio-economic issues related to improved farming systems in the major tropical ecosystems found in developing countries and the specific technical needs to improve the productivity, efficiency, sustainability and stability of production for major food crops, livestock and aquatic resources. An example of success in this effort has been the identification, testing and distribution of a biologic control organism to combat the cassava mealy bug that spread into Africa devastating this basic food crop of subsistence farmers. Another research effort producing a major payoff is the identification of an African

cattle strain resistant to sleeping sickness spread by the tsetse fly; this disease prevents profitable cattle raising in large parts of Africa.

Energy, Forestry and Natural Resources

Developing countries require increasing supplies of natural resources and energy to support expanding economies. The energy program seeks to develop new approaches to energy problems through research and adaptation. The environment and natural resources program assists in achieving broad economic development through conservation of natural resources.

Energy Technology. Research and development is being sponsored for energy production from biomass resources (principally sugar and rice residues and wood wastes), which also helps to diversify rural economies. The use of clean coal technologies also is being tested and encouraged.

To meet the objectives of environmental protection and indigenous resource use, USAID is promoting the transfer and development of cost-effective applications of renewable energy technologies. Specific adaptations of small hydro, geothermal, wind and photovoltaic technologies, for instance, are being funded. In addition, increased efficiency has direct benefits in both economic and environmental terms. Therefore, USAID funds programs that attempt to increase efficiency in the utility, industrial, building, transportation and residential sectors.

USAID is part of a multi-institutional network which seeks to identify innovative financing resources, and provide policy guidance and technological solutions for power crises in developing countries. The network is comprised of the Inter-American Development Bank, Asian Development Bank, International Finance Corporation, United Nations, U.S. Trade and Development Program, Electric Power Research Institute, and the Southern California Edison Company.

Coastal Resources Management. The USAID Coastal Resources Management project has conducted pilot projects in three developing countries: Ecuador, Sri Lanka and Thailand. The purpose of this project is to transfer U.S. experience and technology in coastal management to enhance economic development in the coastal zones of developing countries while sustaining the natural resource base. This year, the project has focused on activities that support coastal agriculture and near-shore fisheries. Areas include management of mangrove forests; design, construction and management of ponds for aquaculture; management of fishing over coral reefs; stabilization of seagrass beds; and production of marine algae. The project now is tackling controversial conflicts in resource uses, and is assisting the government of Thailand in establishing a coastal development review authority as well as a national policy for use of the coastal zone.

Forestry/Fuelwood. The Forestry/Fuelwood Research and Development (F/FRED) project catalogues the research results of species trials for fast-growing trees in a databank shared globally with other forestry research networks. These results allow small farmers to take advantage of genetic improvements of multipurpose tree species (MPTS) by integrating trees into farming systems throughout differing climatic and ecologic zones. Genetic improvement of MPTS is taking place through conventional tree breeding procedures and through the use of new biotechnologies such as tissue culture. F/FRED also is concentrating on alley cropping research as an appropriate and

effective agroforestry technology for increasing food production and other goods such as fuelwood and fodder. F/FRED has shown that alley cropping systems using MPTS can be integrated into small farms.

Biologic Diversity. A new project in USAID, Conservation of Biologic Diversity, reflects the Agency's recognition that maintenance of biologic diversity is a necessary condition for achieving short and long term sustainable development. The Conservation of Biological Diversity project will consist of five major activities: (1) technical assistance, (2) research, (3) training, (4) information exchange and evaluation, and (5) pilot demonstrations. The project is oriented to the delivery of assistance to developing country governments and private organizations in order to help them perceive and act in their own settings.

Health and Nutrition

The general health policy of USAID is to increase life expectancy in developing countries and to remove poor health as a barrier to economic and social development. To achieve this goal, the health portfolio is characterized by a wide range of activities with a special emphasis on child survival. In addition to work on oral rehydration therapy (ORT), diarrheal disease and acquired immune deficiency syndrome (AIDS) which is detailed in previous editions of this report, the health program is focussed on several major objectives:

Vaccine Development. USAID is intensively engaged in the development of an effective vaccine for protection against malaria. Clinical trials of candidate vaccines were initiated, and preparations for field trials of prototype vaccines began in FY 1988.

Vaccine development research has concentrated largely on key pediatric diseases. Vaccines being developed, improved or tested include a prototype malaria vaccines, measles vaccine for younger infants, pertussis vaccine with fewer side effects, genetically engineered oral vaccine against enteric (typhoid) fever, a safer and more effective cholera vaccine, a vaccine against rotavirus as the most common cause of pediatric diarrhea; streptococcus vaccines (Group B) to protect against intrauterine infections, and a vaccine against Hansen's disease (leprosy).

Maternal and Neonatal Health. Child survival is intimately linked with maternal survival. The underlying and often the direct causes of infant deaths are related to the health and nutritional status of the woman during pregnancy, the quality of care during pregnancy, and the delivery. To improve maternal health, USAID promotes birth spacing, immunization, breastfeeding and improved weaning practices, pre-natal and post-natal care, and adequate maternal nutrition.

Combating Dietary Iron Deficiency. Research on food fortification has been conducted to develop new ways of delivering bioavailable iron to people. A novel iron fortificant is available for use in selected food staples, such as whole wheat flour. Furthermore, a new sustained release dietary iron supplementation capsule has been developed which slowly releases iron in a way that potentially may improve the effectiveness of the product as well as stimulate user compliance. Both the iron fortificant for staple foods and the slow-release iron supplementation capsule are ready for demonstrations under field conditions.

Vitamin A. The question of the appropriate food vehicles for delivering supplemental vitamin A is being researched through a USDA project supported by USAID. One method, used in Bangladesh, is to fortify the wheat used in supporting food-for-work projects, or in feeding programs for nutritionally at-risk groups. The use of other commodities, such as rice, salt, sugar and monosodium glutamate as vitamin A carriers currently is being studied in other countries.

At the urging of the Subcommittee on Vitamin A Deficiency Prevention and Control of the National Academy of Sciences' Committee on International Nutrition Programs, further research on the following topics is being included in the new Vitamin A for Health project: (1) immunocompetence, especially as it relates to the structure and function of epithelial tissue, (2) morbidity, depending upon the type of infection and the presence of other deficiencies, and (3) ways of improving the field practicality and quantitative interpretation of currently recognized indicators of vitamin A status.

Rural and Institutional Development

Managing Energy and Resource Efficient Cities. USAID has developed and refined an approach to community involvement in planning for energy and resource efficiency. The plan requires a cross sectoral examination of the activities of the city and identification and adoption of technical or management changes to alter present practices. Sectors represented include energy supply, land use planning, transportation, urban agriculture and waste management. This planning has resulted in adoption of biogas digesters, passive heating and cooling, improved waste collection and recycling, land reclamation, intensified urban agriculture and improved transportation systems. The Tennessee Valley Authority (TVA) is supervising the collection of data from the cities that have adopted this planning approach, and TVA's synthesizing the approach into guidelines for USAID and for wider dissemination.

Human Settlements and Natural Resource Systems Analysis. USAID has developed a prototype geographic information system for storing, recalling, manipulating, appraising and displaying spatial data. Patterns indicated by the system enable users to quickly focus on the probable causes of the spatial arrangements of data. For example, if agricultural productivity is the variable, random patterns of high or low productivity would indicate that the cause might be related to on-farm practices while grouped patterns would suggest an underlying common environmental or shared social cause. The system also can be used to identify conditions that may preclude use of a planned intervention such as agriculture on areas that have both steep slopes and fine soils, or to select areas for interventions where soil type, distance from transportation, land value and availability of water would be appropriate for specific crop types.

Communications for Technology Transfer in Agriculture. Research is underway in Niger to explore ways in which improved communications, including state-of-the-arts video technology, can be used to enhance indigenous agricultural innovation and technology diffusion in West Africa. Social scientists identified local agricultural innovations and the informal communications networks (such as marketplaces and mosques) that traditionally are used to transmit information on technological change throughout the countryside. Research demonstrates that local farmers eagerly seek out information on new agricultural technologies and do their own agricultural experimentation to identify those technologies which are most suited to their

particular production environments. Such findings provide key methodological insights that can improve the efficiency of formal agricultural research and extension.

Population

Support for voluntary population and family planning programs is an essential part of U.S. development assistance. Family planning programs enhance individual freedom to choose the number and spacing of children, provide critical health benefits for mothers and young children, and contribute to more rapid social and economic development.

Biomedical Research in Family Planning. The main advances in FY 1988 include: (a) Submission of a new drug application to the FDA for the Norplant implant system which provides up to five years of effective contraception; (b) Initiation of a phase III clinical trial of the USAID 90-day norethindrone microspheres injectable contraceptive -- this system shows great promise of being the first injectable contraceptive approved by the FDA; (c) Initiation of a phase II clinical study of the 90-day norethindrone biodegradable implant in the U.S.; (d) Completion of preclinical toxicology on a method for female non-surgical sterilization which uses an iodine solution--the FDA has granted an Investigational New Drug (IND) exemption to initiate a phase I clinical trial; and (e) The FDA has approved an IND to initiate a phase I clinical trial of propranolol, a compound with spermicidal activity which is being developed in an attempt to improve the efficacy of currently available spermicides.

Improved Surgical Technique for Vasectomy. The Association for Voluntary Surgical Contraception (AVSC) is introducing an improved vasectomy technique in the U.S. and in its international family planning programs. This refined "no-scalpel" technique can be performed faster than conventional vasectomy, eliminates the need for a surgical incision and has a much lower incidence of post-operative complications. The introduction of this technique is expected to make vasectomy more acceptable to male involvement in family planning.

Demographic and Health Surveys. USAID is recognized as a leader in promoting the use of sample survey technologies for population and health program evaluation and for documenting demographic and health trends. Data from these surveys have impacted on policies, programs and scientific knowledge. In fact, most current knowledge about recent trends and determinants of fertility, family planning and infant mortality has come from these surveys.

Program in Science and Technology Cooperation (PSTC)

The PSTC seeks to take advantage of breakthroughs on the cutting edge of science and to explore the potential uses of innovative technologies. The program is implemented primarily through a competitive research grant mechanism. Some 57 new grants totalling over \$8 million were awarded during FY 1988.

Competitive Research Grants Program. Evaluations were completed of three modules--Biomass Production and Conversion, Biotechnology in Plant Systems, and Biotechnology/Immunology. All were judged generally successful by outside scientific review panels, and recommended for continuation. Attention may be directed to PSTC for improved potato cultivars; particularly important are developments which may lead to commercial true seed or hybrid potato lines, and techniques to introduce recombinant genes into potato cultivars.

The National Academy of Science (NAS) Program. The NAS held a meeting in October to review PSTC funded research on acute respiratory infections in children. The program has provided a unique insight into the causes of mortality from these diseases in LDC. The NAS report entitled Quality Protein Maize has indicated that cultivars are available which can yield improved nutrition with no cost in yield or farm inputs. A new USAID-NAS cooperative agreement was negotiated to strengthen the support and networking of the PSTC grantees.

DEPARTMENT OF AGRICULTURE

The U.S. Department of Agriculture (USDA) continues to be very active in supporting scientific and technical exchange activities with other countries throughout the world. A number of USDA employees are on loan to USAID, the U.N. Food and Agriculture Organization, and other government and multilateral agencies. Such activities usually are not reflected in the USDA budget, as salaries typically are paid by the borrowing organizations. They are a significant showing of USDA support for these activities. For example, U.S. meat inspectors are inspecting packing and processing plants in many areas of the world to assure wholesome products, some of which are imported into the U.S.; foresters are attempting to control damage to watersheds and improve the environment; landscape architects are introducing new species and are turning wastelands into recreational areas; soil conservationists are working on water and soil projects designed to lessen harm to the environment; and nutritionists are attempting to improve the diets of socio-economic disadvantaged populations.

Joint research activities and exchanges continue to bring U.S. scientists into close collaboration with agricultural scientists in some 30 nations, including China, Egypt, Israel, Poland, Spain and the USSR. Much of the costs to USDA of cooperatively supported research is borne by funds generated from surplus commodity sales, income from trust funds or other income not included in the USDA budget. The largest USDA program, in terms of dollars is the Mexico Screwworm Commission and the closely related Mexico Screwworm Support activity. This program is designed to completely eradicate from Mexico a dangerous livestock pest. At the same time, it has provided a barrier against the re-entry of this insect into the U.S. USDA also is very active in supporting efforts to eliminate foot-and-mouth disease in Mexico, Panama and Colombia.

USDA jointly sponsored several international conferences during 1988. These included the Water Quality Modeling Conference in Logan, Utah, and the first International Walnut Conference in Yalova, Turkey. Numerous scientists from many countries attended. Plans already are underway for conferences to be held in 1989 and 1990.

DEPARTMENT OF COMMERCE

Office of the Assistant Secretary for Productivity, Technology and Innovation

The Office of the Assistant Secretary for Productivity, Technology and Innovation comprises the Office of Productivity, Technology and Innovation (OPTI), the Office of Federal Technology Management (OFTM), and the National Technical Information Service (NTIS).

Office of Productivity, Technology and Innovation. OPTI promotes a favorable climate for private sector innovation and improvements in technology utilization and productivity. Its

activities focus on the removal of policy barriers, incentives for investment in research and development, information and catalytic services, and domestic and international cooperation in science and technology. Key projects have dealt with the cost and availability of U.S. capital, antiquated features of U.S. antitrust laws, the lack of adequate protection for intellectual property, and the need for metric conversion.

International cooperation between American and foreign technology-based companies can expand U.S. access to foreign markets, increase trade, and provide access to technology being developed abroad. To assist small and medium-sized companies access foreign markets, OPTI has worked with other governments creating cooperative arrangements modeled after the Binational Industrial Research and Development Foundation (BIRD-F), a bilateral agreement that has resulted in more than 160 joint ventures between U.S. and Israeli companies since 1977.

Twenty joint ventures have resulted from the agreements signed with India in 1985 ("PACT", funded by USAID) and France ("FACET") in 1986. OPTI serves on the advisory boards of the two agreements and counsels U.S. companies interested in participating in the programs.

The Office of Metric Programs (OMP). In 1988, OMP counseled numerous firms engaged in engineering, manufacturing and trade regarding the increasing import restrictions that many metric countries place on non-metric goods. OMP also maintains a metric coordinating committee structure for metric initiatives of the federal agencies and state governments. In 1988, OMP co-sponsored several conferences with trade groups and professional organizations on the role of metric use in international trade. OMP staff also counseled members of the education community on issues relating to the teaching of two measurement systems in the U.S. In addition, OMP advised and assisted members of Congress and congressional committee staffs in connection with specific metric usage issues and policies.

Office of Federal Technology Management. The Office of Federal Technology Management (OFTM) develops policies and procedures for promoting the commercialization of technology developed with federal financial support. It accomplishes this objective through policies that (1) permit federal contractors who have developed inventions to retain ownership, and (2) encourage federal laboratories to enter into cooperative research arrangements with private sector firms; under these agreements the laboratories can grant favorable patent rights to the firms. The objective of these policies is to ensure that the technology remains under the control of those who developed it, understand it best, and have the ownership incentives to exploit its commercial possibilities.

As such, OFTM is directly involved in reviewing bilateral science and technology agreements under which federal agencies engage in science projects with other nations. The office reviews these agreements to ensure that there is a fair allocation of resulting property rights between the U.S. and the foreign participant. In addition, it ensures that appropriate consideration has been given to whether the substantive law of the foreign partner adequately protects technology that may result from such cooperation.

Many international science and technology agreements that the U.S. entered into in a different economic climate are now inconsistent with new laws. OFTM has been active in reviewing and negotiating U.S. government science and technology agreements with other countries in order to ensure that they

are, or become, consistent with the new technology management policies set forth by the Administration and Congress. The office has crafted technology ownership provisions that are being added to these agreements as they come up for renewal.

OFTM was directly involved in negotiating the recently signed U.S.-Japan Non-nuclear Research Agreement, making this new agreement consistent with U.S. government policy. OFTM participated during FY 1988 in similar negotiations with the governments of South Korea, the People's Republic of China, the Soviet Union and others. The Department of Commerce is working closely with the U.S. Trade Representative, the Department of State and other agencies to ensure that science and technology agreements complement domestic science and technology policy.

National Technical Information Service. The primary mission of the National Technical Information Service (NTIS) is to collect and disseminate scientific and technical reports prepared by or for the U.S. government. Its principal clientele is U.S. industry and academia. NTIS sells government research, development and engineering reports. It has become the main source for federally generated data files as well as government-owned patent applications.

Approximately 24 percent of NTIS sales are made overseas or through known foreign organizations that purchase NTIS reports for shipment overseas. NTIS has cooperating arrangements with organizations in over 60 countries. These organizations purchase NTIS reports for further dissemination in their countries and, particularly in Europe and Japan, actively acquire technical information for inclusion in the NTIS data collection.

NTIS acquisitions come from most countries of the world, particularly the industrialized nations. Over 16,000 foreign government and non-government gray literature reports (i.e., unpublished research) were added to the NTIS data collection during FY 1988. These reports were acquired directly through NTIS agreements or were submitted by other U.S. government agencies which have agreements with foreign government counterparts.

The U.S. Congress, the Administration and the private sector have expressed a high level of interest in Japanese technical information. Japanese research organizations do not widely distribute their reports within Japan, and there is no central source where U.S. business firms can acquire such Japanese technical information. In FY 1988, NTIS sponsored a research visit to Japan to investigate how Japanese reports in less well known journals (i.e., gray literature) are collected and disseminated.

The Japanese Technical Literature Act of 1986 directed the Secretary of Commerce to prepare and disseminate the annual directory that lists all programs and services in the U.S. that collect, abstract, translate and distribute Japanese scientific and technical information. In line with this requirement, NTIS in 1988 prepared and published the first edition of the Directory of Japanese Technical Resources, 1987. To enhance its acquisition effort in Japan, NTIS employed an information specialist to establish working relations with various Japanese research and development organizations. Acquisition agreements have been signed with more than 50 Japanese organizations.

NTIS also is the U.S. representative for the Japan Information Center of Science and Technology (JICST), which provides U.S. access to on-line Japanese bibliographic citations through the JICST On-Line Information Service (JOIS). In 1988,

NTIS proposed that JICST load its English language data base on the NTIS system to allow U.S. customers more direct access to this source of technical information.

NTIS also participates in bilateral cooperation as a member of the Indo-U.S. Joint Subcommittee on Science and Technology, and is the lead organization in the information sub-group. Through this group, five Indian information scientists participated in the 1988 On-Line Conference and met with a number of U.S. information organizations. These meetings are expected to lead to joint venture business opportunities in India.

NTIS represents CENDI, an interagency group set up to promote cooperation and efficiency among government technical information agencies, on the Governing Board of the International Translation Center. The center, in cooperation with the U.S. National Translations Center, maintains a collection of scientific and technical journal articles translated into European languages, primarily English. In an effort to make these reports more available to the general public, NTIS organized a series of meetings with U.S. firms interested in obtaining translated technical reports.

Under the auspices of the U.S.-PRC Joint Commission on S&T Cooperation, NTIS signed a protocol to exchange technical information between the two countries. The Institute for Scientific and Technical Information of China (ISTIC) was the signatory for the PRC. NTIS provides extensive on-the-job training to ISTIC personnel, who also travel to the U.S. for training programs.

Office of Japanese Technical Literature

In June of 1987 the Under Secretary for Economic Affairs established an Office of Japanese Technical Literature to carry out the requirements of P.L. 99-382, the Japanese Technical Literature Act of 1986. The office coordinates federal efforts to acquire abstract, translate and disseminate Japanese technical literature, and performs numerous activities as specified in P.L. 99-382 to encourage the use of Japanese technical literature in the U.S. These activities include publication of annual reports on important high technology developments in Japan, and issuance of a periodic bulletin highlighting activities of the office and other federal efforts to acquire Japanese information.

The Secretary of Commerce has submitted a report to Congress, prepared by the office, on federal activities to acquire, translate and disseminate Japanese technical literature. In 1988, the office sponsored several interagency meetings designed to enhance coordination of Japanese technical information activities, and anticipates additional workshops on (1) access to current sources for Japanese information including extant and emerging technical on-line data bases, and (2) Japanese-English machine translation efforts. To address bilateral policy issues such as copyright concerns and access to Japan's gray literature, the office helped establish a task force on scientific and technical information under the recently renewed bilateral science and technology agreement with Japan.

Bureau of the Census

The mission of the Bureau of the Census in the international arena is to maintain communication with sister agencies around the world, and provide statistical support for U.S. government policies. In FY 1988 a number of activities

were undertaken in support of this mission. The International Statistical Programs Center (ISPC) conducted a publications exchange with nearly all the statistical agencies in the world. It also hosted approximately 500 foreign visitors.

In addition, the ISPC provided technical assistance to USAID, assistance in the placement of resident advisers in Saudi Arabia, Nigeria, Bangladesh, Haiti and Zambia. Short-term technical assistance was provided to approximately 50 countries. Since 1947, the ISPC has offered a comprehensive statistical training program to participants around the world, and in 1986 a parallel program in Spanish was begun. More than 100 students per year are trained in the English language program. ESAYTEC, the Spanish language program, trained about 90 persons in FY 1988.

The ISPC has developed generalized computer software for processing census data and surveys. This software has been installed in more than 200 locations in over 100 countries. Recently, the ISPC has focused on software for microcomputers, developing the IMPS (Integrated Microcomputer Processing System for Censuses and Surveys) and CENPLAN, a package for identifying resource needs for census processing.

The ISPC also has developed case study materials for censuses and surveys. These serve as the basis for workshops, and are used as resource materials in developing countries on three continents. This year the Bureau's Center for International Research began development of a data base on the incidence of AIDS around the world. This data base is being funded by a consortium of U.S. government agencies.

The Census Bureau's technical assistance activities are provided on a cost-reimbursable basis. The largest single source of funding is the Kingdom of Saudi Arabia, which underwrites a large program of technical assistance in Riyadh. The other primary source of funding is USAID, although the U.N. and other governments directly fund many students in the Washington-based Census training programs.

The international program of the Census Bureau contributes to the improvement of statistical collection and use around the world. The Census Bureau continued activities under bilateral agreements for statistical cooperation with Canada, China and Mexico. In FY 1988 the Census Bureau hosted a landmark delegation from GOSCOMSTAT, the Soviet Union's central statistical agency. A return delegation is scheduled to visit the USSR before the end of the fiscal year. The Census Bureau's international activities do not have major direct foreign policy implications, but they offer the opportunity for quiet cooperation in a number of areas where it is in the long-term interest of the U.S. to improve relations.

International Trade Administration

The International Trade Administration (ITA) plays a leading role within the Department of Commerce in coordinating the Department's review of international science and technology agreements. Per Executive Order 12591, ITA works closely with other agencies such as the State Department, the U.S. Trade Representative and the Office of Science and Technology Policy to ensure that the negotiation or renewal of such agreements takes into account the level of protection for U.S. intellectual property rights offered by the country in question. Adequate protection for intellectual property will greatly aid U.S. businesses that currently incur enormous economic losses due to widespread intellectual property violations. In addition, ITA

ensures that the Commerce Department's interest in the effective protection and equitable allocation of intellectual property rights is balanced with trade policy considerations. In FY 1988, some of the more important science and technology agreements that were concluded or negotiated were the U.S.-Japan Agreement, the U.S.-USSR Basic Sciences Agreement, the U.S.-PRC Agreement, and the U.S.-Korea Agreement.

ITA also is involved in international environmental agreements affecting the course of domestic and international business. The recently signed Montreal Protocol on Substances that Deplete the Ozone Layer is an example of the melding of science policy and trade issues which have become an integral part of international trade policy. ITA provided substantial assistance to the development of the final U.S. position and participated in the international negotiations for the limiting of ozone depleting substances. The final protocol reflects the orderly removal of these compounds without significant trade distortion. ITA participated in the agreement to limit nitrogen oxides emissions which was approved by the President in August, and also was involved in international discussions on the issue of global warming. ITA is an active participant in the review of U.S. policies governing export of hazardous waste and export of banned and restricted chemicals and pesticides. In these latter issues particularly, ITA contributes its expertise in trade procedures to design environmental policies which are most efficient and effective, but which minimize trade distortions while effecting desired scientific objectives.

The National Oceanic and Atmospheric Administration

The National Oceanic and Atmospheric Administration (NOAA) predicts changes in, and ensures timely information about, the oceans and atmosphere, and manages marine living resources so as to advance economic development, protect national interests and maintain the quality of life in the U.S. This mission, based on research and data requirements about the global atmosphere, ocean, space and sun, necessitates active NOAA participation in international organizations and bilateral agreements. The NOAA programs for earth environmental research, monitoring, modelling and data archives contribute to international understanding of global environmental change, ecosystem dynamics and marine living resource management.

Global Climate Change. International interest in assessing the role of natural climate variability and anthropogenic causes for climate change, in particular the depletion of the stratospheric ozone and the role of "greenhouse" gases in climate warming, has acted as a central theme of recent NOAA bilateral and multilateral activity. The space and temporal scales of climate change and oceanic circulation patterns transcend all geo-political boundaries. No single country can mount the necessary resources required to adequately address the complex interrelationships of these planetary scale geo-physical phenomena. Increasing bilateral and multilateral cooperative activities of NOAA with countries form all parts of the world emphasize the international character of the earth's global atmosphere, ice and ocean system.

Studies of natural interannual climate variability, such as El Nino and the Southern Oscillation, can make an important contribution to climate change studies and ultimately to improved U.S. weather prediction models. The U.S. and India agreed on studies of the climate variability and monsoon this year to be funded by the U.S.-India Fund. The U.S. and PRC completed their fourth joint cruise in the Pacific to improve understanding of the interaction of the tropical ocean and

global atmosphere (TOGA). This 15,000 mile joint cruise aboard a Chinese vessel involving 15 U.S. scientists and 110 Chinese scientists and crew provided vital environmental data on oceanic and atmospheric conditions. This bilateral cooperation is an important component of TOGA. The intergovernmental TOGA board, set up in November 1987 to implement TOGA, is sponsored by the World Meteorological Organization and Intergovernmental Oceanographic Commission. This 10-year global program studies the feasibility of, and provides the scientific background for, modelling the coupled ocean-atmosphere system. In the future, the model will allow prediction of ocean-atmosphere system and its variations on time scales of months to years.

Since 1984 NOAA has funded a specialized oceanographic center in Hawaii which coordinates a Pacific-wide sea level observation network. This center is instrumental in monitoring and analyzing El Nino events and large scale ocean circulation variations. Building a global sea level network is essential to measuring changes in the average height in sea level, and to determine thermal expansion of the oceans due to global climate warming. The Soviet Union joined the network in October 1987. There are 30 countries and a total of 76 stations in the Pacific.

American, Canadian and British scientists studied how the waters of the Atlantic Ocean and the atmosphere above it process chemicals, such as carbon, sulfur and nitrogen, that can influence climate. Their research, conducted aboard a NOAA research vessel in the summer of 1988, extended from the Arctic Circle to Barbados.

The joint communiques of the December 1987 and May 1988 summit meetings between President Reagan and General Secretary Gorbachev called for a joint report on future climates. The National Climate Program Office (NCPO) at NOAA coordinates U.S. activities under the U.S.-Soviet bilateral agreement including climate and paleoclimate studies in the Arctic and measurements methane and ozone changes in the Arctic and Antarctic regions.

NOAA, EPA and the Canadian Climate Program Office organized the "First U.S.-Canada Symposium on the Impacts of Climate Change on the Great Lakes Basin" in September 1988. The symposium brought together members of the science community, private enterprise, urban planners, public utilities, and managers of all levels of government to actively discuss ways to mitigate or adapt to permanent changes in Great Lakes Water Level.

NOAA celebrated the 30th anniversary of its Hawaiian atmospheric monitoring station, which has compiled the world's longest continuous record of carbon dioxide concentrations in the atmosphere. This data archive, also part of the UNEP BAPMON, is essential to climate change research because long-term data sets provide the baseline against which to measure climate change.

NOAA participated in the interagency Ozone Trends Panel which released its results in March 1988. The report contained observational evidence that atmospheric concentrations of ozone-depleting gases from anthropogenic sources continue to increase. The model-driven predictions are broadly consistent with observed changes in column ozone, although other chemical species are predicted with more accuracy.

NOAA co-sponsored the Polar Ozone Workshop, the first meeting of its kind which focused explicitly on polar ozone. It presented a forum for the first presentation of results from (1) the 1987 Airborne Antarctic Ozone Experiment; (2) the 1987 National Ozone Expedition II based at McMurdo Station,

Antarctica; (3) the 1988 studies of the Arctic ozone based at Thule, Greenland, and Esrange, Norway; and (4) experimental and theoretical studies of numerous scientists worldwide.

Living Marine Resources. NOAA is a leader in international efforts to understand the relationship of marine ecosystem dynamics and change to living resources management. As a result of renewed fisheries cooperation, the U.S. and USSR jointly sponsored a scientific symposium in July 1988 to address scientific questions regarding the Bering Sea fisheries. Scientists from Japan, Korea (ROK), China (PRC), Poland and Canada participated. There has been a dramatic unregulated increase in fishing activity beyond the U.S. and Soviet 200-mile zones. U.S. and Soviet scientists do not have sufficient information to predict what effect these unregulated increased harvest levels will have on the fisheries resources within the U.S. and Soviet zones. The two countries hope to promote, with the cooperation of the participants, a program to increase scientific understanding of the relationship between fisheries stocks in different parts of the Bering Sea in order to enhance management and conservation of the stocks.

NOAA cooperation with Poland on surveying bottom fish stocks of the Antarctic was continued during the 1987-1988 season. The results confirmed the continued depleted state of the bottom fish populations. The U.S. team also surveyed krill and the dependent seal and penguin populations. Abundance levels of krill were 50 percent lower than during the previous season. The krill information is used to evaluate catch levels of krill that will ensure appropriate ecologic balance in the Antarctic ecosystem.

The survey supports an international effort by 20 nations in the Commission for the Conservation of Antarctic Marine Living Resources to manage the area's marine living resources. The international effort combines research elements on the collection and analysis of data to provide information on the location, abundance, composition and condition of the principal populations with studies of biologic and physical oceanography.

NOAA conducts research to help conserve those species that are or might become endangered as a result of incidental takes in fisheries operations, such as turtles and cetaceans (*i.e.*, dolphins and porpoises) from shrimp and tuna harvests respectively.

In FY 1988, NOAA continued its support for the protection of marine mammals and endangered species. In October, NOAA supported the Second Western Atlantic Turtle Symposium (WATS II) at Mayaguez, Puerto Rico. Public and private representatives from more than 30 countries exchanged information on the status of marine turtle stocks, conservation and enhancement efforts, and ideas on how further to protect these animals.

At the 40th Session of the International Whaling Commission (IWC) at Auckland, New Zealand in May and June 1988, the U.S. continued to support a strengthening of the IWC moratorium on commercial whaling and closer scrutiny of whaling programs ostensibly undertaken for scientific purposes. Separate resolutions were adopted concerning the scientific programs of Iceland and Norway which found that neither program met the IWC adopted criteria for research involving the taking of whales. Following consultations between U.S. and Icelandic officials at Reykjavik in June 1988, Iceland modified its research proposal and reduced the proposed level of harvest which, in the U.S. view, improved the Icelandic program such that it did not diminish the IWC conservation program.

Earth Observation Satellites. NOAA continued to oversee and advise the Earth Observation Satellite Company (EOSAT) on the international aspects of the U.S. Landsat program. EOSAT is under contract with the government to commercialize Landsat. This includes conducting day-to-day Landsat satellite system operations and building an additional satellite. Twelve satellite remote sensing agencies outside the U.S. currently participate in the Landsat program through bilateral Memoranda of Understanding (MOUs) signed with NOAA. Landsat program activities have been marked by EOSAT efforts--assisted by NOAA--to develop new commercial relationships with foreign ground station operators, and to implement initial commercial domestic and international marketing strategies. NOAA, EOSAT and the 12 foreign participating agencies exchange ideas and information at annual meetings of the Landsat Ground Station Operations Working Groups.

The NOAA initiative in connection with the International Polar-Orbiting Meteorological Satellite (IPOMS) Group to increase multilateral cooperation on future polar-orbiting meteorologic spacecraft has resulted in specific plans by European counterparts of NOAA to supply instruments for the morning polar platforms that Europe will provide to the Columbus/Space Station program. European contributions will help defray the cost of NOAA polar meteorologic satellites. NOAA has continued its participation with NASA and its Space Station partners in the International Coordination Working Group (ICWG). Through groups such as IPOMS and ICWG, NOAA has reached a significant degree of consensus with its international partners on the configuration of the future polar-orbiting satellites.

NOAA also has continued its participation in the Committee on Earth Observations Satellites (CEOS) in which coordination is carried out among space agencies with spaceborne earth observations missions, including global climate change. The work of CEOS primarily is conducted by two technical working groups--a Working Group on Data chaired by NOAA and a sensor Calibrations and Performance Validation Working Group. Through such data management and calibration/validation coordination, considerable advantages can be realized in sharing costs, expertise and data.

On July 1 the U.S., USSR, Canada and France signed the international Cospas-SARSAT Program Agreement which provides for long-term continuity of the Satellite-Aided Search and Rescue system. The system uses the NOAA polar orbiting weather satellites along with Soviet navigation satellites to provide alert and location information on aircraft and vessels in distress. To date, over 1,150 lives have been saved as a direct result of the COSPAS-SARSAT system.

National Institute of Standards and Technology

In carrying out its traditional mission, the National Institute of Standards and Technology (NIST) strives to assure international compatibility of uniform measurements and international acceptance of U.S. standards, practices and technology. International features of NIST programs frequently are covered by formal cooperation agreements, but occasionally involve less formal sharing of scientific data by groups of scientists in two or more countries' standards offices. Technical subjects in these international cooperative arrangements cover virtually the entire range of the Institute's program--measurement methods and standards, optical spectroscopy, thermodynamics, physical and chemical properties, construction technology, and much more.

Serving the priority objective of strengthening the competitiveness of American industry, NIST represents the U.S. in such organizations as the International Bureau of Weights and Measures and the Organization for International Legal Metrology (weights and measures for regulated transactions). NIST scientists are members of numerous technical committees in the International Standards Organization, and the bureau provides policy and technical support to the General Agreement on Tariffs and Trade (GATT) and U.S. negotiators participating in the work of the GATT. NIST scientists continue to be active during FY 1988 in setting, testing and interpreting the interconnection standards required for international data transmission between networks.

Interest in, and exchanges with, Japanese scientific laboratories continue to be active and stimulated by the many impacts from Japanese activities on U.S. foreign policy, trade deficits and technology development. For example, during FY 1988, under a bilateral agreement with NTT Laboratories, several visits of NIST scientists have occurred and one NTT scientist is spending a year in NIST working on information network standards. In FY 1988 the NTT Directors' Award was shared by a NIST scientist for joint research conducted during an exchange visit to Japan in FY 1987. Separately, a NIST senior scientist started a year-long fellowship at the Electrotechnical Laboratory of MITI. In 1988 NIST also hosted a technical conference of Japanese officials which exchanged information on recent research results in building technology and earthquake effects.

NIST is very active in research collaboration in several nations with institutions which are part of U.S. joint science and technology programs open to many U.S. agencies. NIST presently is supervising over 40 collaborative projects with research institutes and universities in Yugoslavia, funded by the Joint Board for Scientific and Technological Cooperation. NIST is preparing plans to participate in a similar joint program established in 1988 with Poland. NIST, along with the Office of Naval Research, has gained approval of the government of India during FY 1988 for initiating several new research collaborations in materials and physical sciences to be funded by the U.S.-Indo Joint Commission. In addition to the benefits these research collaborations bring to NIST, the very positive reactions of the foreign researchers and institutions are a plus to U.S. foreign policy and establish supporting linkages that continue into the future.

NIST continues to have a large number of scientists from foreign countries carrying out collaborative research at NIST laboratories for extended periods up to one year. The level of such collaboration has grown steadily in recent years, and in FY 1988 involved over 260 scientists from 37 countries. In addition to completing valuable research, this activity is well received by foreign nations and directly contributes to improved long-term relations at both the institutional and individual levels. As with all NIST international involvement, it is found that increased purchases of U.S. manufactured instruments and other equipment often results.

National Telecommunications and Information Administration

The National Telecommunications and Information Administration (NTIA) is the principal telecommunications policy adviser to the President. It develops and coordinates Executive Branch policy in telecommunications and information. NTIA is also responsible for managing the radio spectrum assigned for federal use, providing technical support to international telecommunications conference activities, and providing technical assistance in telecommunications matters to other federal agencies.

The goals of the NTIA cooperation with developing countries are to increase U.S. understanding of selected developing country telecommunication policies and infrastructures, and to identify projects that will help improve U.S. access to market opportunities in these countries. Efficient telecommunications infrastructures can stimulate economic development, while easy information transmission facilitates trade, investment and national stability.

NTIA relies on collaboration with the Commerce Department's International Trade Administration (ITA) and with the U.S. telecommunications industry through the major trade associations. NTIA has undertaken several projects in selected countries in the western hemisphere and the Pacific islands, where a model was developed that has been adapted for China and southeast Asia.

In FY 1988, NTIA continued its efforts in three areas of importance to U.S. government objectives in international scientific and technological cooperation: (1) the implementation of the U.S.-PRC Telecommunications Protocol; (2) telecommunications infrastructure development in the Caribbean and the Pacific Basin; and (3) the U.S. Telecommunications Training Institute (USTTI).

China Protocol. The purpose of this five-year protocol, signed in May 1986, is to promote scientific and technological cooperation in the field of telecommunications between the U.S. and China. In FY 1988, there were major activities under the protocol. One of these events was a visit to the U.S. by an 11-member delegation from the PRC Ministry of Posts and Telecommunications led by Vice Minister Zhu Gaofeng. This mission followed a visit by a U.S. government and private industry team to China in November 1986.

The purpose of the Chinese visit was to enable senior Chinese telecommunications officials to gain an understanding of telecommunications in the U.S. with particular emphasis on management, operations and the role that government plays in a privatized and competitive industry. Meetings were held at Washington, D.C. between the Department of Commerce (NTIA), the Federal Communications Commission, the Department of State, the Office of the Postmaster General, and the Director-General of Intelsat. Private sector companies visited during an eight-city tour of the U.S. included AT&T, NYNEX, BellSouth, BellCore, U.S. West Pacific Bell, GTE-Florida, CONTEL/ASC and GTE-Hawaii. Meetings also were held with Motorola, MCI, International Information Systems, UNYSIS and U.S. Sprint.

The second event was the initiation of a task on the development of Radio Spectrum Management Techniques. A team of U.S. specialists visited China to conduct a survey of current Chinese procedures for spectrum management and to conduct seminars on the computerized techniques employed in the U.S. A report of that survey has been provided to the Chinese MPT. The report includes recommendations for a development program to computerize the Chinese system. As a follow-on, a team of Chinese officials will visit NTIA for hands-on instruction in these techniques.

Caribbean Projects. A report on the telecommunications infrastructure of Costa Rica was written and presented to the government of Costa Rica in May 1988 as part of the Caribbean Telecommunications Infrastructure Development Project created in 1987 by NTIA and ITA to complement President Reagan's Caribbean Basin Initiative (CBI). The report is the third in a series of in-depth studies on existing and planned telecommunications

equipment and services available in selected Caribbean Basin countries, and was written to enhance the effectiveness of the CBI by expanding trade and investment. The study report on Costa Rica describes the findings of a private/public sector technical assessment team led by the Department of Commerce; these findings were presented at the Costa Rican Electrical Institute's 25th anniversary conference on telecommunications and computer equipment. In addition, the presence of the technical assessment team led by the Department of Commerce in Costa Rica strengthened the Caribbean Telecommunications Council, which decided to hold a mid-year meeting in Costa Rica in May.

Pacific Projects. NTIA participated in the Department of Commerce's Micronesian mission in September 1987 and identified several projects which needed funding involving training, a specialized management needs assessment and general telecommunications needs assessment. As a result, NTIA will initiate a needs assessment in Micronesia in the fall of 1988 and the Department of the Interior agreed to provide funding in FY 1987-1988 for a spectrum management study for the Federated States of Micronesia, the Republic of Palua and the Republic of the Marshall Islands.

As a result of NTIA efforts, a public/private ASEAN (Association of Southeast Asian Countries) conference co-sponsored by the U.S. government, U.S. industry and the government of Indonesia, will take place in Bali in October 1988. Funded by U.S. industry, the conference will bring six ministers of southeast Asian countries together with representatives of the U.S. government and U.S. industry to discuss state-of-art technological requirements in Brunei, Indonesia, Malaysia, the Philippines, Singapore and Thailand. By facilitating communication between U.S. firms and southeast Asian government officials concerning ASEAN policy objectives, the conference should serve as a vehicle to enhance the competitiveness of U.S. industry interested in trade in the six countries.

U.S. Telecommunications Training Institute. The U.S. Telecommunications Training Institute (USTTI), established in 1982 to share technological advances in the U.S. with developing nations, continued its successful and popular program in FY 1988. Under USTTI, tuition-free courses are provided by leading U.S. telecommunications corporations and government agencies at various sites throughout the U.S. In 1988, 37 separate courses were offered. To date, USTTI has taught close to 1,500 telecommunications managers, engineers and technicians from over 100 countries. Since the institute's inception, NTIA has been instrumental in planning and developing its curriculum. In 1988, as in past years, NTIA co-sponsored a six-week course in "Radio Spectrum Management and Computer-Aided Techniques" for 21 foreign telecommunications managers and engineers from developing countries. Contacts established through USTTI courses have been valuable to U.S. representatives in international telecommunications fora in helping promote better understanding of U.S. positions and in facilitating cooperative agreements and programs.

Patent and Trademark Office

The Patent and Trademark Office (PTO) administers the nation's patent and trademark laws. The office also works to strengthen intellectual property protection worldwide. PTO provides advice to other government agencies on intellectual property matters and assistance on intellectual property issues in international science and technology agreements as requested.

Executive Order 12591, "Facilitating Access to Science and Technology", directs federal agencies to take into account, when considering international agreements on science and technology or providing bilateral assistance, whether those countries adequately protect U.S. intellectual property rights.

Working through the Department of Commerce S&T Coordinating Committee, the PTO provides technical advice and assistance to the Department of State, the Office of the U.S. Trade Representative (USTR), the Office of Science and Technology Policy (OSTP), and other agencies as requested on the adequacy of protection available in specific countries and recommends appropriate terms for science and technology agreements to address specific intellectual property problems. On request and as resources permit, the PTO also provides knowledgeable personnel to participate in negotiation of intellectual property terms of bilateral agreements.

The PTO also works to strengthen U.S. competitiveness by improving the intellectual property protection available in other countries. The PTO has worked closely with USTR and the International Trade Administration on intellectual property issues in multilateral fora such as the GATT, as well as on investigations of Brazil and the Republic of Korea under Section 301 of the Trade Act of 1974, and on other bilateral consultations. The PTO recently has participated in consultations on the adequacy of intellectual property protection in Chile, Singapore, India, Indonesia, Thailand, Malaysia, Mexico, the Philippines, Colombia, Venezuela, Argentina, the Marshall Islands, Micronesia and Taiwan. The PTO works extensively with the World Intellectual Property Organization (WIPO) on efforts to revise the Paris Convention, harmonize patent laws, and adopt a treaty for the protection of mask works.

The PTO is responsible for administering Section 914 of the "Semiconductor Chip Protection Act of 1984". Interim protection is available under the act to foreign mask work owners as an incentive for other countries to pass similar laws.

The PTO offers advice and assistance to help developing countries build patent systems. Bilateral agreements with other patent offices, such as the Patent Office of the People's Republic of China and the African Intellectual Property Organization, permit the exchange of information with the other offices. The PTO trains developing country nationals in the protection of intellectual property under these agreements and in cooperation with WIPO. Under a trilateral agreement, the PTO cooperated with the European Patent Office and the Japanese Patent Office to build a file of U.S. and foreign patents from which information can be readily exchanged among the three offices. The agreement also is designed to help coordinate views on harmonizing and strengthening national patent laws.

DEPARTMENT OF DEFENSE

The U.S. seeks to enhance the security of the free world through promoting international defense science and technology cooperation among allies and other friendly nations while at the same time protecting militarily critical technology from diversion to potential adversaries. Ongoing objectives include the integration of scientific and technological advances into U.S. military capabilities. Through sustained cooperation in technology and development, the U.S. improves the effectiveness of its own defenses, increases mutual compatibility of military forces, and strengthens alliances. The U.S. also continues to encourage allied countries to field advanced military

capabilities and to establish or strengthen technology security programs in order to deter the uncontrolled flow of free world technology to the Soviet bloc, hostile countries and terrorist organizations.

Strategic Defense Initiative

Since President Reagan introduced the Strategic Defense Initiative (SDI), many U.S. allies have expressed interest in participating in this program. Fully recognizing that U.S. and allied security interests are inseparable, the President seeks the development of technologies for defense against ballistic missiles of all ranges.

On March 26, 1985 the Secretary of Defense invited the NATO allies along with Australia, Israel, Japan and the Republic of Korea to participate in the SDI effort. The United Kingdom, West Germany, Israel, Italy and Japan have signed Memoranda of Understanding (MOUs) on participation in SDI. Additionally, the Strategic Defense Initiative Organization (SDIO) concluded project-specific Memoranda of Agreement with The Netherlands Organization for Allied Scientific Research in July 1987 and with the Government of Israel in June 1988 covering cooperative research on electro-magnetic launchers and an Arrow interceptor experiment, respectively. While specific provisions of these agreements are classified, they address such topics as intellectual property rights, the transfer of technology and security.

The actual scope of allied research and development varies among the participating countries. Participants contribute their unique scientific and technical expertise. The allies can provide access to facilities not currently available in the U.S. and to teams of researchers with special competence in diverse technical areas. Moreover, allied insights into theater defense objectives offer invaluable opportunities for the examination of theater defense architectures. Thus, allied technical capabilities can shorten timetables and reduce the costs of the research and development effort.

The following list identifies the status from the beginning of FY 1966 to the end of FY 1988, of allied prime contracts and major subcontracts awarded in conjunction with the SDI research effort.

<u>Country</u>	<u>Number</u>	<u>Value</u> <u>(\$ millions)</u>
United Kingdom	41	44.19
West Germany	29	46.51
Israel	13	169.50*
Italy	22	7.50
France	6	6.25
Canada	5	1.07
Belgium	1	0.09
Netherlands	3	12.07**
Totals	120	287.28

* Includes \$31.6 million contribution by Israel

** Includes \$7.0 million contribution by The Netherlands

Armaments Cooperation and Defense Trade

The goal of this science program is to achieve maximum return on each R&D dollar spent by coordinating research, development, production, and logistic support. The U.S. and its

allies can accomplish this by equitably sharing and protecting mutually developed technology to avoid unnecessary expenditures and duplication of effort. Cooperative joint research development, production and acquisition programs are explored thoroughly. This includes establishing common operation and design requirements, maintaining mission effectiveness, bilaterally sharing technology with near equal benefits, using economies of scale, avoiding duplicative costs, and standardizing forces and equipment to enhance interoperability.

Section 1103 of Public Law 99-145 (Nunn Amendment to the FY 1986 Defense Authorization Act) provides funding for the U.S. government to engage in a wide variety of cooperative research and development programs with the NATO allies. Over 100 multilateral and bilateral programs are in various stages of negotiation, with more being planned for 1989. Similar efforts are underway with non-NATO allies including Japan, Israel, Egypt, Korea and Australia.

This cooperation and trade is carried out through a framework of coordinated measures to maintain technology security. The Department of Defense (DoD) has made technology security an integral element of agreements with NATO and other allies on cooperative defense programs in technology, such as the SDI, and an important part of other collaborative efforts.

Organizations for International Technology Transfer

NATO Defense Research Group (DRG). DRG, the highest NATO forum for the discussion of its scientific and technical research needs, conducts research through which cooperative efforts might lead to increasing military capabilities or in cases technological advances are needed for current programs. In 1988 the U.S. participated in seven panels, two special subgroups, and 42 research study groups.

Advisory Group for Aerospace Research and Development (AGARD). AGARD was founded to stimulate advances in the aerospace sciences for the common defense of NATO. It annually sponsors 20 symposia and specialist meetings, eight lecture series, and approximately 100 consultations and exchanges between members. AGARD encourages a true two-way flow of technical information between the U.S. and its NATO allies.

Supreme Headquarters Allied Powers Europe (SHAPE) Technical Center. The SHAPE Technical Center (STC) provides scientific and technical advice and assistance to SHAPE and Allied Command Europe (ACE). STC analyzes ACE force capabilities, and examines international command, control and communications (C3) for ACE.

The U.S. provides 21 scientists and engineers for the center's staff. Drawing upon resources of all the NATO allies, the center annually works on approximately 30 projects that improve the NATO C3 capabilities. Each year STC publishes approximately 20 to 30 reports and enters them into the Defense Technical Information Center system.

The Technical Cooperation Program (TTCP). TTCP provides a means to become acquainted with defense research and development activities. The program concentrates primarily on military technology and technologies relevant to defense. Some areas covered include chemical defense, undersea warfare, infrared and electro-optical technology, aeronautics, conventional munitions, and electronic warfare.

Australian, British, Canadian, American (ABCA) Standardization Program. The ABCA Standardization Program continues to provide the mechanism for standardizing military operations and technology developments among the participating nations.

Information Exchange Agreements

Data Exchange Annexes (DEAs). Master Mutual Weapons Development and Data Exchange Agreements (MWDDEAs) are negotiated with each nation in which a program of data exchange is to be undertaken. They specify the general scope of the exchanges, classification limits and channels of correspondence, and provide assurances and procedures concerning the safeguarding of information received. Mutually desired information exchanges in individual subject areas are subsequently and separately agreed to in DEA annexes to the master agreements. It is, therefore, possible to establish a number of separate DEAs with one country covering a spectrum of technologies and applications and also to establish, with a number of countries, specific DEAs in a single technology or application area.

Information Exchange Projects (IEPs). Similar to DEAs, IEPs provide for formalized information exchange and cooperation between the Armed Services of the U.S. and other participating nations. The agreements cover operational, tactical and follow-on support of specific equipment as well as the exchange of research, development, and test and evaluation information.

Exchange Scientist Program (ESP). The Department of Defense participates in several scientist and engineer exchange Programs. For example, several foreign engineers and scientists are hosted by the U.S. Military Services each year. The Services, likewise, can participate in the program by nominating U.S. scientists and engineers for placement in foreign research and development facilities. ESPs exist with Australia, Brazil, Egypt, France, Germany, Israel, Korea, Norway and Pakistan. Exchanges also occur under The Technical Cooperation Program with the United Kingdom, Australia, Canada and New Zealand.

The ESP program involves a broad spectrum of research and development topics, and is valuable in terms of providing hands-on experience with foreign technology and managerial processes. Information obtained is very broad and is generally of a classified nature. The U.S. Army and U.S. Air Force serve as the Executive Agents for the Defense Department. ESP programs with Canada, Spain and the United Kingdom are pending.

U.S. - India Research Programs Funded by the Office of Naval Research. In ocean sciences, the Indo-U.S. cooperative research program provides access to marine research. Oceanographically, the intense forcing caused by the monsoon wind regime makes it an ideal natural laboratory to study the mechanisms of physical forcing starting with the wind, the resulting advection and upwelling of the water and the subsequent chemical and biologic changes, particularly increased productivity.

Specific programs include:

- Bioactive substances from the Indian Ocean;
- Studies on Quasicrystalline Phases (MC-1);
- Mechanical Properties of Advanced Ceramics (MC-2);
- Passivation and Stress Corrosion Cracking (MC-3);
- Accelerated Corrosion of Marine Alloys (MC-4); and
- Wear-Resistant Tribological Coatings (MC-5).

DEPARTMENT OF ENERGY

Most of the Department of Energy's (DOE) international research and development programs have been undertaken for the direct support they provide to DOE energy security goals and

objectives. The DOE approach to international collaboration was clearly stated in "Energy Security: A Report to the President of the United States" submitted by Secretary Herrington in March of 1987.

International collaboration on research and development improves the efficiency of investment and maintains momentum for technology development. It helps the U.S. get the biggest return on its investment in the face of current budget restraints.

The objectives of international collaboration may include one or more of the following: exchanging information, sharing costs, accelerating progress, broadening the intellectual base, reducing unnecessary and inefficient duplication of facilities, and fostering international commerce. Particular emphasis has been placed in the past few years on collaboration based upon early consultation in the planning phase of major research and development activities to facilitate projects of mutual interest. This approach is continuing to grow in importance.

In addition to the gains in DOE program effectiveness contributed by international research and development collaboration, such joint activities in all phases of energy research and development speed the development and dissemination of technologies. This, in turn, promotes the growth of safe and effective alternatives to worldwide dependence upon petroleum products, and the enhancement of the energy security of the U.S. and its allies.

In FY 1988, the international research and development activities of the DOE grew in scope and were characterized by a continued emphasis on joint project planning with international partners, particularly with member countries of the International Energy Agency (IEA) of the Organization for Economic Cooperation and Development (OECD). The DOE, along with the Department of State, provides the U.S. representation to the IEA, and is particularly active in the IEA Committee on Research and Development (CRD). The CRD encourages international collaborative research in new technologies in the field of energy, and the DOE is the contracting party for the U.S. in 36 energy research and development agreements under the aegis of the IEA. These agreements cover a broad spectrum of technologies, including coal, enhanced oil recovery, alcohol fuels, renewables, energy conservation, fusion, energy technology systems analysis and information exchange. Notable among these is the 1988 Energy Technology Data Exchange agreement, which allows 12 countries to share bibliographic research and development information in all energy fields and is based upon the Energy Data Base maintained at the Oak Ridge National Laboratory.

In order to expand the development and dissemination of technologies which reduce dependence upon petroleum products, the DOE has supported the establishment of the Centre for the Analysis and Dissemination of Demonstrated Energy Technologies (CADET) within the IEA. In March 1988, nine member countries of the IEA signed an agreement to establish CADET with the purpose of sharing the results of energy technology development efforts applied to specific problems. Utilizing a computer support network, CADET will receive, analyze and transmit technical and project data on these problems to participating nations. The shared technical applications, which will be drawn from the building, industrial and commercial sectors, are expected to result in further energy conservation, greater energy efficiency and reduced operating costs.

In October 1987, the DOE formally accepted, along with counterpart organizations in Japan, the USSR and the European Community (EC), the invitation of the Director General of the International Atomic Energy Agency to participate in the conceptual design of an International Thermonuclear Experimental Reactor (ITER). The ITER conceptual design program is the result of a U.S. proposal for enhanced international collaboration in fusion. This proposal followed the agreement by President Reagan and General Secretary Gorbachev to advocate "the earliest practicable development of international cooperation" in obtaining the beneficial use of magnetic fusion energy. The program objective is to define a set of technical characteristics of the ITER and to carry out the work necessary to establish its conceptual design.

In December 1987, Secretary Herrington invited our major OECD allies to participate in the design, construction and utilization of the world's most advanced high energy particle accelerator, the Superconducting Super Collider (SSC), to be built in the U.S. The SSC, approved by President Reagan in January 1987, has excited significant worldwide scientific interest and support. A series of high-level visits in the first six months of 1988 following the Secretary's invitation demonstrated this scientific support, as well as the support of the political and industrial communities.

During FY 1988 DOE expanded its bilateral cooperative activities as well, entering into 13 new bilateral agreements and annexes. Most notable of these were a new research and development Memorandum of Cooperation (MOC) with the Australian Department of Primary Industry and Energy, which Secretary Herrington signed in April 1988, and the expansion of cooperation with the USSR through the MOC on Civilian Reactor Safety which was signed jointly with the Nuclear Regulatory Commission in April 1988 during the 7th Joint Committee Meeting on the Peaceful Uses of Atomic Energy.

The MOC with Australia allows for a wide range of cooperative activities in mutually interesting areas of energy research. Initial cooperative activities are being negotiated for the exchange of information on current research and development work in progress, alternative transportation fuels and oil shale project data exchanges.

The MOC on Civilian Reactor Safety with the USSR continues a program of cooperation in reactor safety which was begun as a result of the Chernobyl accident. Topics to be covered include reactor operations and safety, personnel training and health, and environmental concerns.

ENVIRONMENTAL PROTECTION AGENCY

U.S.-Canada Environmental Cooperation

During FY 1988, the U.S. and Canada continued to cooperate in resolving a wide range of transboundary pollution issues. The recommendations of the Report of the Special Envoys on Acid Rain, produced by Drew Lewis for the U.S. and William David for Canada, have been endorsed by both countries and are being implemented.

The EPA, the Ministry of the Environment of Canada, the New York Department of Environmental Conservation (NYDEC), and the Ontario Ministry of the Environment reached agreement on a four-part management plan to clean up toxic chemicals in the Niagara River. The plan is being implemented, and the two governments are developing a lakewide management plan for Lake Ontario.

The U.S. and Canada also concluded during FY 1988 a bilateral agreement on the transboundary movement of hazardous waste. By eliminating the need for prior written consent for each shipment of hazardous waste across the border, the agreement ensures an uninterrupted flow between the two countries in the legitimate trade of hazardous waste for recovery and recycling.

Senior U.S. and Canadian environment officials meet routinely to review progress in cleaning up the border area and to agree on direction for future environmental cooperation. In addition, technical experts from both countries continue the day-to-day informal contacts through cooperative environmental research programs and participation on numerous boards and committees of the International Joint Commission (IJC). Finally, the U.S.-Canada Great Lakes Agreement was amended in November 1987, adding a requirement that both countries address the control of toxic substances in the Great Lakes. This provides for a "lakewide ecosystem approach" for the Great Lakes, including deposition of nutrients, toxic compounds, and other pollutants which impact water quality.

U.S.-Mexico Border Environment Agreement

In 1983, President Reagan and President de la Madrid signed the U.S.-Mexico Border Environment Agreement. The agreement committed both governments to cooperate fully in the protection and improvement of the environment within 100 kilometers on either side of the border. It designated EPA in the U.S. and the Secretariat of Urban Development and Ecology (SEDUE) in Mexico as the coordinating agencies. Four annexes to the agreement have been signed: (1) resolution of the San Diego/Tijuana border sanitation problem, (2) accidental releases of polluting substances along the inland boundary, (3) transboundary shipment of hazardous wastes, and (4) reduction of sulfur dioxide emissions from copper smelters in the border area. EPA has proposed a fifth annex on transboundary air pollution in border cities. A Joint Contingency Plan to implement annex 2 was signed on January 29, 1988. Under the proposal, contingency plans for emergencies in each of the 28 border sister cities will be developed.

Technical Working Groups co-chaired by the EPA and SEDUE meet at least twice a year to discuss border environmental issues in the areas of air, water, hazardous water, hazardous waste, and joint emergency response planning. EPA has provided SEDUE with training in several areas of air pollution management and in hazardous waste issues during the last three years. SEDUE has made a series of new training requests of EPA, which EPA plans to address in part over the next year.

Since annex 3 was signed in November 1986, EPA has notified SEDUE of the desire of U.S. firms to export over 300,000 tons of hazardous waste to Mexico, of which Mexico has accepted 30,000 tons and rejected 270,000 tons. The Hazardous Waste Working Group currently is working on the special case of the maquiladora (e.g., in-bond assembly plants) industry's generation and disposal of hazardous wastes. Mexico met the requirements of annex 4 when the Nacozari, Sonora copper smelter's sulfur dioxide scrubbers went on line in May 1988. The Phelps-Dodge smelter in Douglas, Arizona was shut down in January 1987 in compliance with the annex. The Water Working Group continues to discuss means to solve the Tijuana sewage treatment problem and other border sewage treatment problems. SEDUE and the Mexican Secretariat of Foreign Relations are currently reconsidering a State Department supported EPA proposal for a joint international treatment plant and outfall.

Transboundary Movement of Hazardous Waste

In the past year, the issue of hazardous waste management has continued to receive widespread public attention as a major environmental and health issue both for the American public and for the international community. Considerable attention also has been given to the issue of the transboundary movement of hazardous waste, and many countries have joined with the U.S. by participating in several ongoing projects in international organizations such as the OECD and the U.N. Environment Program (UNEP). The U.S. has played an active and constructive role in the hazardous waste activities of the OECD and UNEP.

Under U.S. hazardous waste export regulations of the Resource Conservation and Recovery Act (RCRA), EPA requires prior notice of proposed export, including information on quantity, type of waste, frequency of shipment and a description of how the waste is going to be treated. Upon receipt of a notice, the U.S. transmits the information to the receiving country with the understanding that EPA must have the country's prior written consent in order for the shipments to take place. A copy of the consent must accompany each shipment, which gives the U.S. the capability of enforcing the export regulations. In the late spring, EPA received three notices for proposed exports to Africa which subsequently were turned down, thus illustrating that these regulations can assist developing nations in protecting the environment and health of their people.

In addition to the RCRA regulations, there also is a provision in U.S. law allowing for bilateral agreements which may streamline the notification and consent procedures. This ensures that the regulations do not hamper the legitimate trade in hazardous waste across national frontiers. The U.S. already concluded bilateral agreements with Canada and Mexico, both of which serve the common interest of the U.S. as countries along its border.

World Health Organization

During FY 1988, the World Health Organization's Division of Environmental Health continued to coordinate multi-year project work under several important U.N. programs in which the U.S. participates. These efforts included: WHO and UNEP Global Environmental Monitoring System (GEMS) program work on worldwide air pollution monitoring and reporting, worldwide fresh water pollution monitoring, and developing newer GEMS efforts on human exposure to pollution; WHO, UNEP and ILO in liaison with FAO carried out U.N. International Program on Chemical Safety project work on assessing the health and environmental effects of industrial chemicals and pesticides, improving methods for evaluating the toxicity of chemicals, development of a U.N. chemical safety cards project for eventual use of the cards worldwide for emergency preparedness and response; preparation of a WHO, World Bank/U.N. technical manual on treatment and disposal of hazardous waste in developing countries; and other pollution control and health protection projects. The EPA-WHO Collaborating Center for Environmental Pollution Control contributed to the above efforts, as well as supporting the work of the WHO International Agency for Research on Cancer, the Pan American Health Organization, and other WHO related activities.

OECD Environment Committee

The Environment Committee and its expert groups continued multi-year OECD project work from 1986 through FY 1988 and implemented new efforts. The OECD efforts of interest to the

U.S. in FY 1988 included: further development of the long-term project on regional modeling of photochemical oxidants as well as developing newer projects on motor vehicle pollution control, especially in reference to heavy duty vehicles and in-use automobiles; planning future OECD efforts on the toxicity and control of existing chemicals; information sharing on hazardous substances accidents prevention and response; review of costs and benefits aspects of pollution control; further development of the proposed OECD convention on international movements of hazardous wastes; ground water and surface water protection and management; review of the potential effects of global climate change; integration of agricultural and environmental protection policies; technical assistance to developing countries that receive development aid; and assessing and reporting on the state the international environment. The Committee also planned its 1988 work program, and outlined its preliminary priorities for the remainder of the decade.

Federal Republic of Germany (FRG)

Bilateral cooperation with environmental authorities and scientists in the FRG provides significant benefit to the EPA domestic program. The two countries share common concerns and commitments, and benefit through exchange of information and experience on their approaches to the solution of major environmental problems.

Current work under the U.S.-FRG Agreement on Environmental Cooperation focuses on acid deposition and its ecologic effects, hazardous waste management, innovative regulatory approaches, source controls for air pollution, radiation protection, ground water protection, and other topics. Specialists from both sides visit each other's laboratories and field sites to continue cooperative research on forest damage, a major concern in the FRG and of growing interest TO U.S. scientists. At their meeting in December 1987, EPA Administrator Thomas and German Environment Minister Toepfer endorsed ongoing work and discussed new topics for inclusion in the program.

Under the agreement, EPA initiated a personnel exchange in order to further the professional sharing of experience. During 1985 and 1986, five EPA personnel worked with their colleagues in German organizations for up to six months on hazardous waste management and enforcement techniques, control of automotive air pollution, and legal elements for environmental case development. In 1987 and 1988 a German specialist on enforcement of hazardous waste regulations spent a year with EPA. Working at the EPA National Enforcement Investigation Center, the Chicago regional office and at Headquarters, the FRG specialist provided substantial input into EPA's program while obtaining on-the-job experience and information which he is using in his work with the German Ministry of Environment. The U.S. also had significant exchange with the FRG through multilateral fora such as the OECD, the Economic Commission of Europe (ECE) and the NATO Committee on the Challenges of Modern Society (CCMS). Within CCMS, the U.S. and the FRG led a major effort on control of dioxins. The German Marshall Fund of the U.S. has promoted and assisted in the exchange of specialists and meetings on development of innovative economic instruments to encourage voluntary compliance with pollution regulations.

The Netherlands

Cooperation between the U.S. and the Netherlands takes place under a Memorandum of Understanding (MOU) between EPA and the Dutch Ministry of Housing, Physical Planning, and

Environment. A major activity during FY 1988 was the conduct of a major international symposium on ozone-related issues. The third in a triennial series of symposia co-sponsored by EPA and the Dutch Ministry of Housing, Physical Planning, and Environment drew over 250 experts from around the world to Nijmegen for a week of discussions on both tropospheric and stratospheric ozone. The paper presented and the information transferred expanded the global understanding of technical and regulatory problems and possible solutions.

Ongoing cooperation in other areas is focused on innovative cross-media, results-oriented environmental management, hazardous waste management and emergency preparedness, water quality protection, health effects, acid deposition, and other priority topics. A number of Dutch specialists have worked in EPA laboratories under the EPA program for visiting researchers.

Brazil

EPA has provided training for technical and professional staff of the Sao Paulo State Pollution Control Agency (CETESB) under an MOU. The training program has covered most areas of modern environmental protection programs, and has involved visits and work assignments in EPA laboratories. Senior administrative personnel had working discussions with EPA regulatory officials at the federal and regional levels. EPA also has arranged for U.S. private-sector consultants to conduct training programs in Brazil.

Japan

The U.S.-Japan Agreement on Cooperation in the Field of Environment was signed in 1975 and extended for five years in 1980 and 1985. EPA and the Japanese Environment Agency exercise general oversight of the agreement and 16 projects which successfully promote the exchange of new technology, practical experience, and data on a broad array of priority environmental issues. Benefits derived by both sides from these exchanges are evaluated at the Joint Planning and Coordinating Committee Meeting (JCCM) which is normally held every 12 to 18 months, alternately in the U.S. and Japan. Waste water treatment, air pollution control, solid and hazardous waste management, toxic substances, environmental impact assessment, drinking water, and food chemistry are the subjects of current projects.

Korea

The MOU signed by EPA and the Korea Environment Agency (KEA) on November 2, 1987 does not take effect until the U.S.-Korea umbrella S&T agreement is signed. Seven possible projects were discussed at the 1987 EPA-KEA meeting including environmental administration, health effects of air pollution, risk assessment, transport of air pollutants, waste water management, eutrophication, and sanitary landfill facilities.

Soviet Union

Activity under the U.S.-USSR Environmental Protection Agreement accelerated measurably in FY 1988. The 181 scientists exchanged nearly tripled from its low point of 67 in 1984, but still remained down more than one-third from the peak in 1979. Mutual attention to macro-environmental issues, especially the question of global climate change, has drawn the U.S. and the USSR toward greater cooperation in addressing global environmental problems. In addition, the USSR has taken a major step in organizing its environmental efforts around a

new State Committee for Environmental Protection. The new committee is slated to become the EPA counterpart under the intergovernmental environmental agreement, and reportedly will have comprehensive authority on issues ranging from research through regulation and enforcement. The implications of this move portend well for the encouragement given by both countries at the Washington and Moscow summits to strengthen their cooperation in environmental protection.

EPA and the new (1988) State Committee for Environmental Protection (GOSKOMPRIRODA)--which is incorporating the environmental responsibilities of GOSKOMGIDROMET--are the executive agencies for this intergovernmental agreement. The agreement renews at five-year intervals unless terminated on six months' advance notice. Joint activities cover the areas of air and water pollution, agricultural pollution, urban environments and park management, nature protection, marine pollution, biologic and generic effects of pollution, environmental effects on climate, earthquake prediction, legal and administrative measures, and environmental education.

DEPARTMENT OF HEALTH AND HUMAN SERVICES

Involvement of the Public Health Service (PHS) in international activities enhances its mission of protecting and promoting the health of the American people. PHS bilateral agreements are aimed at fulfilling that goal and at providing mutual benefit to partner countries. Important advances in the biomedical sciences frequently have been based on the work of individual scientists from many countries, who each contribute important building blocks which eventually can lead to the larger discovery. Communications and exchange of experts, biologies, data and research findings promote scientific achievement as well as reduce duplication of effort and conserve scarce resources. PHS bilateral programs, historically, have focused on mutually beneficial objectives, while at the same time responding to diplomatic initiatives, such as those with India, China and the Soviet Union.

The spectrum of interests and responsibilities of the PHS ranges from, inter alia, the fulfillment of regulatory requirements, such as those of the Food and Drug Administration (FDA), to biomedical research of the National Institutes of Health (NIH), and prevention and control of infectious disease by the Centers for Disease Control (CDC).

The following are highlights of activities and relationships carried out over the past year that deserve special mention.

- A landmark study on AIDS, entering its fourth year, is being carried out in Africa by the NIH and the CDC. Known as Project SIDA, and carried out with the participation of the Zaire Ministry of Health and the Institute of Tropical Medicine of Belgium, the study has identified to date over 6000 AIDS cases in Zaire with a 1 to 1.3 male-to-female ratio. The study was instrumental in confirming that HIV may be transmitted heterosexually. The equal risk of HIV infection in adult men and women of childbearing age in Africa has resulted in frequent HIV transmission during birth. Maternal-infant transmission is an increasing risk in the U.S. Project SIDA is expected to provide U.S.-based studies with valuable supplementary data on maternal HIV infection.

- The CDC has stationed an epidemiologist/virologist in the Ivory Coast to study the natural history and epidemiology of human retrovirus infections, to strengthen activities of the national AIDS committee, and to translate research conclusions into public health interventions. The newly recognized HIV-2 infection will be studied to determine its epidemiology, natural history and laboratory characteristics, as well as its relationship to HIV-1.
- Results from a U.S.-Swedish collaborative study sponsored by the National Institute on Aging, NIH, indicate that brain tissue transplants can reverse learning deficits in severely impaired, aged animals. This work demonstrates the value of basic animal transplant research for studying brain mechanisms which may be important to human disease.
- More knowledge about Alzheimer's Disease and Down's Syndrome resulted from collaborative efforts between U.S. and French scientists. The scientists found that patients with nonfamilial Alzheimer's disease and some types of Down's Syndrome have an extra copy of the gene involved in making amyloid, a substance found in high concentrations in the brains of Alzheimer's patients. These findings help to explain why those with Down's Syndrome often develop Alzheimer's Disease.
- New FY 1987 data from epidemiologic studies of cardiovascular disease in China and Japan show significant differences in disease patterns and outcomes when compared with data on U.S. populations. For Chinese men and women, mean blood pressure and prevalence of hypertension are lower in the south than in the north of China--opposite of the U.S. pattern; serum cholesterol levels of all Chinese populations are lower than in the U.S.; serum HDL cholesterol levels are higher for Chinese men than U.S. men. In Japan, stroke is the most common outcome of hypertension, while in the U.S. heart attack is most common. Studies show that the prevalence of atherosclerotic lesions is three times higher in the U.S. than in Japan, and Japanese populations show that, although the Japanese diet is becoming more Western and presumably more therogenic, ischemic heart disease rates are declining in Japan. The data from these studies raised important scientific questions to be explored in further joint research.
- Under the Reagan-Gandhi Science and Technology Initiative (STI) a new diagnostic test for filariasis based on recombinant DNA technology was successfully tested in India and may have important implications for microbial infections which occur in the U.S. The STI collaborative program on blindness continued its pioneering work on the therapeutic use of vitamin A to prevent blindness in children with measles. A joint case-control study of cataracts explored reasons why onset of cataracts occurs at a comparatively early age in India.
- The CDC provided technical cooperation to 12 countries with a total population of 171 million people. Activities and achievements on a country-by-country basis are extensive. In general, immunization activities included strengthening the vaccine storage, distribution and delivery systems in all countries. Sterilization materials and techniques were improved. Vaccination coverage was increased in nine countries for which data were available. Measles immunization coverage continued to expand. A marked reduction in polio cases was reported

at Kinshasa, Zaire from pre-program levels, and measles and pertussis levels in Rwanda decreased as well. Diarrheal disease control efforts were directed toward expanding effective case management techniques in a number of countries and closely monitoring the functioning oral rehydration therapy (ORT) practices in existing ORT units. Activities dealing with malaria involved continued surveillance for chloroquine resistance, developing simplified treatment schedules for non-literate populations, and developing and implementing appropriate control strategies.

Bilateral cooperation projects are selected according to the interest and priority of the agencies involved in the agreement. Activities conducted intramurally are reviewed for acceptability and technical merit in the same way that other intramural projects are decided upon. Activities that will be conducted through extramural sources receive peer review in the same way as domestic grant proposals or a similar process, depending upon the funding source. Monitoring and evaluation is a continuous process, sometimes through a joint committee that meets annually, biennially or during agreement renewal reviews.

DEPARTMENT OF THE INTERIOR

Fish and Wildlife Service

The Fish and Wildlife Service (FWS) is involved in a broad range of international activities in support of its responsibilities under the Endangered Species Act, the Convention on International Trade in Endangered Species, the Convention on Wetlands of International Importance, and other statutory and treaty responsibilities associated with its general mission and related to the maintenance of biologic diversity. Its programs, devoted to fostering sound wildlife protection practices, provide excellent opportunities for international cooperation.

The FWS takes part in conservation activities with the Soviet Union under the bilateral U.S.-USSR Environmental Agreement. During 1988, 15 delegations of American and Soviet scientists were exchanged on a short-term basis to conduct research on marine mammals, endangered plants, cranes, biosphere reserves, desert ecosystems, and fish husbandry. The FWS also cooperates with counterpart agencies in the People's Republic of China under the U.S.-PRC Nature Conservation Protocol. Activities in 1988 included visits by Chinese delegations to the U.S. on migratory birds and alligator ecology, while 12 American biologists visited China to take part in a joint bird banding symposium. Delegations were composed of representatives of both the public and private sectors.

Using U.S.-owned foreign currencies, the FWS conducts programs in Egypt, India and Pakistan for the conservation of threatened or endangered species. Conservation has a high priority in each country, and the programs in India and Egypt have been supported by the heads of government. Activities include training, research, development of educational materials, and institution building.

The FWS is the implementing agency for the U.S. and for the Western Hemisphere Convention for Protection of Nature and Wildlife Preservation. The Convention calls for hemisphere-wide cooperation in the management of migratory

species, control of trading rare species, and protection of habitats for wild flora and fauna. Activities include cooperative research and planning, training, and conduct of model projects for replication elsewhere in Latin America. Over half of the birds found in North America migrate to Central or South America for part of the year. Many species are important to sportsmen (a \$1 billion business in the U.S.), many are critical to agriculture through insect pest control, and others are valued for intangible or aesthetic reasons. Survival of these species depends upon how they and their habitats are managed, researched and conserved in Latin America. This program is the only U.S. government effort to provide for survival of these species.

U.S. Geological Survey

The U.S. Geological Survey (USGS) conducts international activities in science and technology as adjuncts to domestic programs, under authorization provided in the Organic Act, as revised, and the Foreign Assistance Act and related legislation. International activities and studies have been deemed by the Department of State and the Department of Interior to be in the interests of the U.S. government. Programs with foreign governments are operated under bilateral or multilateral agreements sanctioned by the aforementioned departments and provide opportunities for: (1) comparative studies of scientific phenomena both abroad and in the U.S.; (2) acquisition of data on existing and potential foreign resources of interest to the USGS, the private sector, and the U.S. government; (3) broadening the knowledge, understanding, expertise and international reputation of the USGS staff; (4) developing and maintaining relations with foreign counterpart institutions, and for the conduct of programs that facilitate scientific cooperation and technology transfer; and (5) support of programs of other U.S. government agencies, particularly the political, economic and strategic interests of the U.S. Department of State. Some USGS activities in science and technology serve as contributions to foreign policy decisions.

USGS benefits by gaining knowledge and experience in the countries studied, which then may be applied to domestic studies and investigations elsewhere. Institution building, training programs, and participation and representation in international earth-science organizations, commissions and congresses by USGS scientists establish contacts beneficial to U.S. foreign and domestic policy interests.

Major programs newly authorized in FY 1988 included a 4-year assessment of water resources in Abu Dhabi, United Arab Emirates; a one-year cooperative field program with France on bore-hole geophysical applications to water research; a marine geology research program with Norway; and five programs utilizing remote sensing from LANDSAT and SPOT imagery, three in Africa (i.e., the Famine Early Warning Systems (FEWS), AGRHYMET, a program to improve collection of agricultural, hydrologic and meteorologic data, and Grasshopper and Locust Habitat Identification and Monitoring); one in Bolivia for map revision; and one in Jordan for training in the Mini Image Processing System. However, most USGS international activities in FY 1988 were continuations under the previously authorized programs described below.

The International Strategic Minerals Inventory, a program by the USGS and the U.S. Bureau of Mines in cooperation with Australia, Canada, the Federal Republic of Germany, South Africa and the United Kingdom continues to develop a global assessment of deposits, resources and supply-demand relations for a number of critical commodities including cobalt, nickel,

platinum and titanium. Mineral resource assessments or research and modeling of mineral deposits under bilateral agreements continued in China, France, Japan, Papua New Guinea, Portugal, Saudi Arabia, Spain, Venezuela, Yugoslavia and the Pacific Trust Territories. The assessment programs provide knowledge of worldwide availability of minerals, especially those critical to supplies in the U.S., and assist foreign nations in exploring, exploiting and utilizing their own deposits, some of which might be plentiful enough for export.

The World Energy Resources Program, an extension of the USGS domestic program for oil and gas assessments, presented a report to the 12th World Petroleum Congress at Houston, Texas, in which oil and gas were quantitatively assessed country-by-country worldwide. Also during FY 1988, comprehensive oil and gas reports were completed for: (1) a revised assessment for West Siberia, (2) an initial assessment for southern Africa, and (3) a three volume assessment of China. Other energy studies were the ongoing resources assessments and/or scientific research on coal in Pakistan and Yugoslavia, peat in Indonesia, petroleum in Hungary and the southwest Pacific region, sedimentary basin analysis in Korea, and bore-hole geophysics in Canada. These energy resources studies aid foreign countries in the identification, development and utilization of indigenous supplies, thus diminishing the need to import expensive petroleum products and reducing the reliance on economic assistance programs from without.

In addition to the new programs on water investigations cited above, short-term (less than one-year duration) water resources assessments and research on modeling, including flood control facilities, were conducted by USGS in Antarctica, China, the Dominican Republic, India, Norway, Venezuela and Yugoslavia. The many cooperative programs serve to substantiate the unique character of the USGS as a world-renowned organization having highly qualified personnel with knowledge and expertise in the water resources field.

Activities to mitigate geologic and hydrologic hazards, the predictive investigations and monitoring for volcanic eruptions, and the global research on geophysics, seismicity and earthquakes continued to be USGS international cooperative programs during FY 1988. Funding and activities were increased substantially for the Interagency Volcano Early Warning Disaster Assistance Program and the program for comparative studies of earthquake and tsunami potential in critical zones surrounding the Pacific. Geologic hazard assessment programs continued with El Salvador and in the southwestern Pacific coastal areas; cooperative research on hydrologic hazards was done with Japan. Volcano monitoring and early warning prediction capabilities for eruptions were researched in several Latin American countries and in Indonesia and Italy. In addition to its continuing multilateral programs to establish and coordinate the Global Telemetered Seismic Network and to monitor worldwide seismic data for earthquake prediction, the USGS carried on bilateral geophysical, seismic and/or earthquake studies with various countries including Chile, China, West Germany, Italy, Jordan, Panama, Saudi Arabia, the Soviet Union and Yugoslavia. The continuing hazard studies hopefully will lead to worldwide capabilities to predict hazardous events and mitigate resulting destruction, thus saving countless lives and untold suffering and losses, a benefit not only to the U.S. but also to all humans.

Surveying and mapping in FY 1988 provided geodetic data, aerial photography and satellite imagery to prepare base maps and other cartographic products. Base maps were prepared for Antarctica to support geologic and glaciologic investigations, and the Scientific Committee on Antarctica Research (SCAR)

Library for Cartography was maintained for the National Science Foundation; U.S.-Mexico border image maps were prepared for the U.S. Customs Service and the International Boundary and Water Commission (IBWC); the U.S.-Canada border area digital mapping pilot study was completed in cooperation with the Canadian Department of Energy, Mines, and Resources; cooperative projects continued with the People's Republic of China in the applications of remote sensing and in the development of geographic information systems. The USGS is more extensively applying remote sensing from satellite imagery to all aspects of mapping and resource assessment studies as is evidenced from the continuing studies with Argentina, France, New Zealand, the United Kingdom and the Federal Republic of Germany, and the new programs in Africa, Bolivia, and Jordan as mentioned above.

The new program in marine geology with Norway involves cooperation in the development of methods for processing digital sonar data. Sea floor sonar imaging surveys in cooperation with the United Kingdom continued in FY 1988, as did the five-year program in various aspects of marine geology with Indonesia. Mapping, resource assessment and other activities related to marine exploration and seafloor imagery derive information for long-term planning strategies to reduce U.S. dependence upon foreign supplies of critical minerals.

Climate change and atmospheric deposition programs are receiving increased attention internationally. USGS expertise in environmental protection research, a long-term effort in the domestic program, is being applied to cooperative preliminary studies with the Soviet Union to monitor climate changes and with Canada on standardization of monitoring equipment and procedures to determine atmospheric contents of substances that might produce acid rain.

During FY 1988, 54 foreign nationals from 22 countries received training and 41 visiting scientists from 17 countries conducted research in the U.S. Countless individuals were trained on the job during the activities in foreign countries. Institution building was the major activity in Bangladesh, and was an integral part of the programs in Pakistan and Saudi Arabia. Workshops were held in India on coal geology, in Chile on mineral deposit models and marine geology, in Bolivia on mineral deposit models, and in the U.S. on earthquake hazards; a five-week training course in hydrologic and landslide hazards was conducted in Italy. The organization and upgrading of the earth-science institutions along with the development of libraries, information centers and publication facilities, as well as the training programs, allow USGS to access earth-science and resource-assessment information that can be utilized in domestic studies and will form the bases for recommendations on foreign policy decisions.

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

Since its creation by the National Aeronautics and Space Act of 1958, NASA has successfully conducted an extensive program of international cooperation based on a framework of guidelines designed to maximize the technical, scientific, economic and political benefits of cooperative aeronautical and space activities. The primary objective of NASA in international cooperation has been to benefit NASA scientific programs by identifying and providing opportunities for international involvement in NASA activities.

While the space program is not an instrument designed specifically for foreign policy ends, its contributions to foreign policy are substantial. A robust and durable space

program assists U.S. foreign policy objectives, is essential to a national position of world leadership in a scientific era, and fosters positive perceptions about America.

Foreign space programs present opportunities for cooperation which enhance and extend our own national resource base. Cooperative programs can yield benefits of access to foreign facilities, scientific and technological expertise, research and development activities, and program funds.

Cooperation also can be a factor in minimizing competitive pressure. The development of further mechanisms to secure foreign participation under terms which enhance programs and protect national security and economic interests will serve to advance national goals, further scientific cooperation, and lower U.S. expenditures.

International cooperation in space activities has substantially benefited both the U.S. and its partner nations during the past three decades. As a result of international partnerships, NASA has been able to participate more fully in a number of space activities in the important fields of communications, remote sensing, the space sciences, search and rescue, and manned space systems. International cooperation will continue to play a vital role in coming years in furthering the development and use of space technology as NASA moves ahead into an era of expanded cooperation with a wide range of nations on the Space Station, aboard Spacelab, and in other areas of the space sciences.

NASA will continue to seek active foreign involvement in mutually beneficial space projects where U.S. national interests are served by cooperation. Factors which are weighed in determining national interest include financial benefits of cost sharing; substantive benefits, including access to foreign expertise, facilities or territory to enhance project quality or success; ability to maintain U.S. technological leadership; and consistency with U.S. national policy objectives, including national security and economic interests.

Space Station Cooperation

In June 1986, agency-to-agency and government-to-government negotiations were begun with Japan, Canada and the European Space Agency (ESA) on agreements covering the detailed design, development, operation and utilization of a permanently manned space station with extensive capabilities for scientific research and possible commercial uses.

The completion of these negotiations will result in the signing of agency-to-agency memoranda of understanding (MOUs) between NASA and the partner agencies and government-to-government agreements between the U.S. and the foreign governments participating in the international space station program. With the signing of the MOUs and intergovernmental agreements, NASA and its international partners will enter into the design and development phase of this program--the largest cooperative space program in history. The international Space Station complex will offer unparalleled opportunities for scientific and commercial research on its manned base and related orbiting platforms for a planned lifetime of three decades.

Cooperation with the Soviet Union

On April 15, 1987 the Agreement Between the United States of America and Union of Soviet Socialist Republics Concerning Cooperation in the Exploitation and Use of Outer Space for

Peaceful Purposes was signed at Moscow by Secretary of State Shultz and Soviet Foreign Minister Shevardnadze. The agreement called for the formation of five Joint Working Groups (JWGs) to pursue civil space cooperation in key space science disciplines. The JWGs met as follows: Space Biology and Medicine, August 1987; Solar System Exploration, December 1987; Space Astronomy and Astrophysics, April 1988; Solar-Terrestrial Physics, April 1988; and Earth Sciences, May 1988. The second round of JWG meetings will begin in September 1988. The JWGs will implement cooperation on a list of 16 projects which was appended to the agreement. In addition, technical meetings and other forms of cooperative activity are anticipated as implementation of the projects begins.

The agreement left open the possibility of revision of the list of projects should both sides consider new cooperative projects to be mutually beneficial. Such a revision took place during the Moscow Summit in May 1988. The U.S. and the Soviet Union agreed to a new initiative to expand civil space cooperation by exchanging flight opportunities for scientific instruments to fly on each other's spacecraft, and by exchanging results of independent national studies of future unmanned solar system exploration missions as a means of assessing prospects for further U.S.-Soviet cooperation on such missions. The flight of a Soviet Cosmos biosatellite in the fall of 1987 marked the first significant milestone in cooperation under the new agreement, with U.S. experiments and investigators involved. In July 1988, the Soviet Phobos mission was launched toward Mars and its moon Phobos with significant U.S. participation, as outlined in a number of the agreed projects.

Shuttle Foreign and Commercial Payload Policy. NASA no longer provides Shuttle launch services on a reimbursable basis except for payloads which are Shuttle-unique or those accepted for flight for foreign policy or national security purposes. The foreign reimbursable primary payloads which remain on the Shuttle manifest through 1994 are: Eureka-1 and 02 (ESA free flyers), Spacelab-J (Japanese Spacelab), and Spacelab D-2 (German Spacelab).

International Cooperation in Global Change Studies

The NASA Earth Sciences Program has contributed significantly to international efforts to understand and address global environmental change. Under an agreement with the Chilean Committee for Space Activities, in August 1987 NASA conducted an aircraft campaign over Antarctica staged out of Chile to measure atmospheric constituents and conduct research on ozone depletion.

International Space Year (ISY)

In May 1988, space agencies from around the world endorsed the NASA proposal to establish the Space Agency Forum for International Space Year (SAFISY). SAFISY will provide a forum for expression of views and informal coordination of projects by national civil space agencies in support of the ISY so as to enable the agencies to take these views and projects into account while planning their individual programs for ISY. At the first meeting of SAFISY, the space agencies gave priority to a program of long-term earth observation, as an ISY activity. SAFISY has invited the United Nations' involvement in the educational and applications aspects of ISY and the conduct of activities through the Space Applications Programme with special focus on the needs in developing countries.

Interagency Consultative Group for Space Science (IACG)

The IACG is a multi-agency international forum in which space science activities are discussed on an informal basis among representatives of the member agencies (NASA, ESA, ISAS of Japan, and the Soviet Union's Intercosmos). Its goal is to promote greater coordination among the agencies' planned space science missions in order to further the scientific benefits. Following the successful completion of its coordination of the Comet Halley missions, the IACG in 1986 formalized the procedures for the forum by adopting a Terms of Reference, and also endorsed solar-terrestrial science as the new focus of its activities. The IACG began the implementation of this new focus in its 1987 meeting at Kyoto and will continue coordinated mission planning in November 1988 at its next meeting which NASA will host.

San Marco D/L Launch

Under a cooperative agreement with Italy, the San Marco D/L satellite was successfully launched in March 1988 from the San Marco Platform off Kenya. The Italians built the satellite, and provided one instrument and the launch team. NASA provided three instruments and the Scout launch vehicle. The Federal Republic of Germany also provided one instrument.

NATIONAL SCIENCE FOUNDATION

The National Science Foundation is an independent federal agency established by the National Science Foundation Act of 1950 to promote and advance scientific and engineering progress in the U.S. The Act also assigns to the NSF broad responsibility for encouraging participation of U.S. scientists and engineers in international activities.

It is Foundation policy to foster U.S. knowledge of science and engineering developments in foreign countries, to initiate and support international cooperative activities, to provide opportunities for scientific collaboration in developing countries, and to provide support to U.S. institutions for research done abroad.

In FY 1988, approximately 20 percent of the 12,000 research grants awarded by the NSF had an international component. These ranged from support of participation by U.S. scientists and engineers in international meetings to involvement in large multinational collaborative research projects. NSF grants in which cooperation with a foreign scientist or institution is essential, and which meet the terms of more than 30 bilateral S&T agreements, are managed by the Division of International Programs, a unit of the NSF Directorate for Scientific, Technological, and International Affairs.

In FY 1988, a major force shaping NSF programs was the economic competitiveness challenges from abroad faced by the U.S. Domestically, the Foundation instituted major new policies and programs--in science and engineering education; in extending partnerships among universities, industry and government; and in continuing strong support for all the science and engineering disciplines.

In the international arena, the Administration advanced the importance of an international response to global economic challenges, emphasized comparable access and mutual benefits in cooperative arrangements, stressed adequate protection of intellectual property rights in collaboration, and encouraged more monitoring of science and technology abroad.

NSF involvement in bilateral scientific activities can be traced to the U.S.-Japan Committee on Scientific Cooperation established in 1961 out of discussions between President John F. Kennedy and Prime Minister Hayato Ikeda. Over the next 25 years, the NSF concluded scientific arrangements with more than 30 countries throughout the world. In the late 1970s, a report of the NSF Advisory Committee recommended that the Foundation could do more to access the resources of science and engineering in western Europe. New arrangements with several western European countries followed, and existing cooperation with France and Italy was expanded. In FY 1988, major steps were taken by the Foundation to enhance U.S. benefits from cooperative arrangements, to expand opportunities for American researchers in foreign laboratories and research institutions, and to assess information about foreign research developments.

For Japan, improving access to its science and technology for U.S. researchers already had emerged as an NSF priority in FY 1987. The initial stages of a Japan Initiative were mounted to advance the Japanese language competence of American scientists and engineers; to organize survey teams to assess areas ripe for critical research advances in Japan; and to increase the number of American investigators working for longer durations in Japanese laboratories.

On June 20, 1988, an agreement regarding U.S.-Japan cooperation was signed at Toronto by President Reagan and Japanese Prime Minister Takeshita. This agreement advanced NSF efforts to place more U.S. scientists in Japanese research facilities. Coordinated with four Japanese government entities--the Ministry of Foreign Affairs, the Japanese Science and Technology Agency (STA), the Japan Society for the Promotion of Science (JSPS), and the Ministry of International Trade and Industry (MITI)--expectations are that opportunities will significantly expand for U.S. scientists to conduct research in Japanese academic, government and industrial laboratories. Also, the continuation of the Japan Initiative in FY 1988 supported about 50 Japanese language-study fellowships, the development of curricula and course materials for teaching technical Japanese, and several research visits to Japan.

In FY 1988, the Foundation announced an initiative to support new international research efforts involving U.S. and French investigators in computer science, engineering and mathematics. The focus of the initiative is on critical issues at the interface of these fields, where U.S. and French strengths are complementary. On the French side, the research resources will be concentrated at the French National Institute for Information Science and Automation (INRIA). INRIA also will serve as a focal point for other French research institutes and universities to participate in this initiative.

To address general issues of cooperation among industrial countries--networking/communication systems, large-scale facilities, major life science proposals, and carbon dioxide in the atmosphere--the NSF Director and Deputy Director attended a series of informal meetings in May 1988 with their counterparts from the major European countries, Japan and Canada.

In addition to Japan and western Europe, opportunities for cooperation with Latin America were expanded. In September 1986, Presidents Sarnay and Reagan agreed on a jointly-funded initiative for U.S.-Brazil cooperation in science and technology, and the FY 1988 budget for the Department of State set aside \$2 million for the program. NSF was assigned a lead role in basic science and engineering and approximately

\$600,000 was allocated to the Foundation. In August, the Brazilian government designated counterparts to U.S. government agencies involved in the program, and cooperation should be initiated early in 1989.

In addition, the NSF 1988 Authorization Act directed the Foundation, DOE and NASA to coordinate a study to recommend new directions for U.S.-Latin American cooperation. Completed in June 1988, the study considered the fields of astronomy, biology, geosciences, physics and engineering, and focused on five countries: Argentina, Brazil, Chile, Mexico and Venezuela. The study provided an analysis of S&T capabilities and resources in Latin America; assessed potential mutual benefits from enhanced cooperation; and developed recommendations to advance cooperation in research areas and countries. One suggestion was to establish a high-level panel to address the need for coordination of U.S. efforts with regard to Latin America.

U.S. cooperation with India, under the 1982 Indo-U.S. Presidential Initiative in Science and Technology (STI), was extended for three years in September 1988. Studies continue in agriculture, biomass, engineering and solid state sciences, and monsoon research. New areas include a focused case study of the factors contributing to the failure of the monsoon in 1987 (i.e., the Indian Drought of 1987).

Expanded cooperation between the U.S. and Pacific Rim countries came under consideration in FY 1988. Rapid shifts in worldwide economic and technological leadership are resulting from advances in Pacific Rim countries, particularly the newly industrializing areas in Korea, Taiwan, Singapore, Hong Kong, Indonesia, Malaysia and Thailand.

Building on prior year Administration reestablishment of government-to-government scientific cooperation with Czechoslovakia and Poland, in FY 1988, the NSF concluded agreements for cooperative science programs with these two countries. These new programs build on the NSF experience with other eastern European countries (Hungary, Bulgaria and Romania) and expand their scope to include all countries of the region except the German Democratic Republic.

In October 1987, as a component of improved relations between the two countries, the U.S. government initiated exploratory discussions with the Soviets on cooperation in basic research. The proposed Framework Agreement covers individual Memoranda of Understanding (MOUs) between agencies in each country. A proposed MOU between the NSF and the Academy of Sciences of the USSR (ASUSSR) is being considered. The NSF-ASUSSR program would focus on investigator-initiated, competitively-reviewed cooperative research projects in selected, mutually agreed-upon areas. Currently, issues relevant to the Framework Agreement are undergoing review by an interagency group.

The International Institute for Applied Systems Analysis (IIASA) is a non-governmental international research organization founded in 1972. NSF provided membership support to IIASA through the National Academy of Sciences from 1973 to 1982. Although membership support has not been reestablished, in March 1988 NSF awarded \$455,000 to IIASA for selected Institute projects. Funding was provided through the American Academy of Arts and Sciences which currently serves as the U.S. membership organization for the IIASA.

In FY 1987, an Information and Analysis Section was established within the Division of International Programs to collect and analyze information about foreign science and

technology, and to coordinate the monitoring activities of NSF offices abroad. This year, an important activity of the section, in cooperation with the Departments of State and Commerce (NTIS), was co-management of the STRIDE (Science and Technology Reporting and Information Dissemination Enhancement) study.

The study was conducted in response to Executive Order 12591 of April 10, 1987, which had directed these agencies to develop a mechanism for dissemination of foreign science and technology to U.S. users. Findings and conclusions of the study and the next steps in information dissemination are under review. The Foundation is considering a monthly publication containing staff-generated reports on foreign developments for FY 1989.

The NSF Deputy Director continued to chair the Ciset Working Group of International Science, Engineering, and Technology Education, Infrastructure, and Facilities. Increasing the availability of information resources on foreign science and technology was emphasized by the Working Group. In August 1988, the Working Group began to address issues of comparable access and reciprocity with regard to future implementation of the U.S.-Japan S&T Agreement.

To summarize, international activities have long been central to the Foundation's mission. The NSF continued in FY 1988 to encourage mutually beneficial research relationships between the U.S. and foreign countries, in order to facilitate access to foreign science and technology centers for American scientists and engineers. Growing scientific and technological capabilities abroad placed new demands on the Foundation. The NSF pursued or initiated a wide variety of measures in FY 1988 in response to its international responsibilities.

NUCLEAR REGULATORY COMMISSION

Bilateral Information Exchange Arrangements

Since 1974, the NRC has participated in a wide-ranging, mutually beneficial program of information exchange and cooperative safety and research activities with its counterparts in the international community. The NRC has conducted most of its technical information exchange under the aegis of a series of general safety cooperation arrangements that it has formally concluded. The NRC has some 23 Technical Information Exchange Agreements with regulatory and safety authorities of over 22 countries plus Taiwan. These arrangements call for the establishment of a formal channel for communications with foreign nuclear regulatory organizations for assuring prompt and reciprocal notification of reactor safety problems that could affect both U.S. and foreign nuclear facilities, and for effecting identification of possible "precursor events" that warrant further investigation. As more than 40 percent of the nuclear steam supply systems designed by U.S. firms are located in foreign countries, data from these reactors provide substantial and important input to the NRC operating information data base from which they can, and do, influence U.S. regulatory decisions. These agreements also provide a framework for bilateral cooperation on nuclear safety, safeguards, waste management and environmental protection. They also serve as a vehicle for the NRC to provide assistance in improving nuclear health and safety practices to developing countries importing U.S. power reactors. The agreements typically are written for a period of five years, but contain provisions for renewal by mutual agreement.

The NRC bilateral arrangements call for the exchange of all aspects of nuclear safety and regulatory information via cable and telephone, in letters, technical reports, and other publications, and in training courses, seminars and joint discussions. In some cases, they also provide for general cooperation in reactor safety research and for the long-term assignment of foreign regulatory personnel to the NRC staff or to the NRC programs at the national laboratories for on-the-job training in U.S. regulatory practices and procedures. In all cases, they provide for the protection of information which the NRC's foreign partners have given the NRC in confidence under the condition that it be withheld from public disclosure.

The NRC arrangements with Italy, Belgium and Israel were renewed during FY 1988. Negotiations on the renewals of existing arrangements with Brazil, Greece and Mexico, as well as on a new arrangement with Argentina, are under way.

During this past year, NRC undertook efforts to: (1) expand exchanges of current information with Japan and Western Europe on reactor issues and means to assess and improve operations; (2) broaden and enhance emergency notification and cooperation procedures with Canada, Mexico and in the International Atomic Energy Agency (IAEA); (3) establish information exchange arrangements with Canada and Argentina; (4) expand training support and technical advice to Mexico, Korea and other developing countries; and (5) interact with responsible Canadian parties regarding poor operational performance at Fermi-2.

Cooperative Projects and Agreements

The NRC has established and maintains a network of general and specific agreements on safety research cooperation. These agreements have grown significantly in both scope and substance over the last few years. The NRC currently is involved in over 55 separate research agreements under which it cooperates with over 20 countries in ongoing nuclear safety research projects both in the U.S. and abroad. These research projects make direct contributions of data and analyses needed to confirm and assess computer codes used in the NRC licensing and regulatory process. Some of this cooperative research involves experiments performed in U.S. facilities with foreign countries making direct cash contributions to participate; some of it involves the foreign country providing the results of other complementary or supplementary research it has sponsored in an area of interest or need to the U.S.

The resulting programs often are highly leveraged with research results being obtained at a much lower cost to NRC than would be the case if undertaken alone. NRC benefits from foreign research program costing \$100 to \$150 million per year, using facilities built by others at a cost of \$300 to \$400 million. NRC also receives increased peer review of U.S. research results through these cooperative programs.

Nuclear Safety Activities

During FY 1988, NRC gave high priority to activities which, through NRC participation or support, contributed directly to improved operational safety and radiation protection in the U.S. and in other countries. In addition, high priority was given to activities in the IAEA and the Nuclear Energy Agency (NEA) on radiation protection problems and accountability of sealed sources. Continuing high priority is given to the NRC leadership role internationally in setting the nuclear safety agenda in these two organizations. Bilaterally, NRC sought to define an appropriate cooperative

relationship between the U.S. and the USSR (and to a somewhat lesser degree, Eastern Europe) in the power reactor safety area. NRC continues to support a strong research and information exchange relationship with the advanced countries that are members of the NEA.

DEPARTMENT OF TRANSPORTATION

Safe and efficient national and international transport systems contribute significantly to the economic welfare, quality of life, and political stability of all countries. Nationally the role of the Department of Transportation (DOT) is to assure that U.S. transport systems are adequate, efficient, safe and secure in order to meet the ever-increasing socioeconomic demands involved in the movement of people and commodities. In many respects, however, U.S. national transport goals cannot be accomplished without close and continuous liaison with other countries and regions--particularly in the development, improvement and interfacing of air and sea operations worldwide. For example, the safety of both American and foreign carrier operations are greatly enhanced by bilateral cooperation and the provision of technical assistance and support to other countries. Further, many national and international transportation regulations and policies (e.g., in areas of safety, security, and trade) are established on the basis of accepted scientific findings.

Recognizing, therefore, that cooperation between and among a myriad of national and international entities is inherent in accomplishing many departmental missions and that no country has a monopoly on new ideas or technology (basic or advanced), DOT has continued to encourage and support science and technology (S&T) cooperation. This cooperation is carried out in accordance with the following objectives:

- to access and share transport technology and experience in order to reduce costs and avoid duplication of parallel national efforts;
- to find innovative solutions to common technical and operational problems, particularly in the areas of safety and security;
- to participate in multilateral research and other discussions, and to coordinate national positions in international organizations;
- to support U.S. foreign policy; and
- to promote sales of U.S. transportation equipment and technology.

Currently, DOT has S&T bilateral cooperation arrangements with 24 countries, actively participates in 15 international organizations, and is involved intermittently in the work of other multilateral groups. In addition, during FY 1988, DOT (1) provided cost-reimbursable aviation and highway technical assistance to 67 countries; (2) conducted a large foreign visitor program for technical orientation, general fact-finding, and discussions on policy issues; and (3) provided aviation, highway, maritime and merchant marine training to 490 foreign students. As the level of activity varies from year to year in many of these programs, only major activities for FY 1988 are summarized in this report as these represent progress in achieving one or more of the DOT international program objectives.

Bilateral Program

Canada. At the June DOT-Transport Canada (TC) Cooperative Program Review meeting, the consensus was that the 1970 bilateral agreement was increasingly beneficial to both countries and should be continued and expanded. In FY 1988, the program involved exchanges in six general areas: marine/maritime, aviation, rail, highway traffic safety, highway construction and maintenance, and accessibility for the handicapped. Plans were made to cooperate on a more structured basis on research and development (R&D) efforts designed to gain more knowledge on the impact of transport systems (e.g., human factors and effects on safety), dangerous goods surveillance systems, the state of infrastructures and plans for improvement and maintenance thereof, and urban/suburban travel requirements.

Deputy Secretary Dawson and a DOT delegation were hosted by Canadian Deputy Minister of Transport Shortliffe at a two-day meeting held in late June at Quebec City. Discussions were held on policy issues of mutual interest, including privatization and cost recovery, elimination of substance abuse from the transportation environment, and issues dealing with aviation, motor carrier, highway safety and rail. A new project agreement to cooperate on general R&D was signed at this meeting. In August, discussions were held at Washington between a Canadian delegation led by Assistant Deputy Minister Sinclair and a DOT delegation chaired by Associate Deputy Secretary Pettit on the interpretation of the U.S.-proposed regulations and legislation on substance abuse testing and the resulting impact on the Canadian transport industry.

The active technology sharing and collaboration between DOT and TC specialists and senior-level management on policy issues contribute significantly to the improvement of transport systems in both countries, facilitates and promotes trade, enhances safety and security, and expedites solutions to many transport problems and issues.

China (PRC). Under formal agreements with PRC entities, DOT continued expansion of cooperative ties, particularly in the highway, rail and aviation areas. Highlights of FY 1988 activities were:

- The Federal Highway Administration (FHWA) provided assistance in the development of economic policies to establish a market-based trucking industry and performed a roadway information system survey to assess road conditions and needs. FHWA also hosted a Chinese delegation for a six-week study tour of U.S. toll road operations and facilities to gather information for planning and administering China's first expressways. The Chinese government has proposed that the U.S. construct a demonstration highway in a major industrial corridor of China, utilizing American standards, practices, equipment, products and engineering technology.
- The Federal Railroad Administration (FRA) began agreed exchanges of technical information in such areas as railway heavy haulage technology, track and train safety, and intermodal operations.
- The Federal aviation Administration (FAA) has provided cost-reimbursable assistance to the Civil Aviation Administration of China for air traffic control and airworthiness training, national airspace system planning, supply support services, and flight simulator training evaluation.

The PRC has placed high priority on the rapid development of improved transportation. DOT involvement in the Chinese transport modernization effort has potential for gaining technical benefits for the U.S. in certain transport-related basic science areas, and its interface with Chinese government entities will create opportunities for U.S. private industry.

France. In December 1987, project agreements for cooperation in rail and urban areas were concluded between the French Directorate for Surface Transportation and the FRA and the Urban Mass Transportation Administration (UMTA), respectively. Technical exchanges on high speed rail passenger, freight/passenger communication technology, and urban transport safety and security are complementary to U.S. research priorities.

Germany (FRG). In the area of traffic safety, the U.S. has benefited from communications and exchanges with the FRG Ministry of Transport on crashworthiness and crash avoidance. Two new projects involve (1) a testing program by the University of Heidelberg to determine the relationships between the engineering parameters of a crash and the occurrence and severity of occupant injury, and (2) a program to measure the influence of selected drugs on driving performance using the Mercedes-Benz driving simulator at Berlin.

The Netherlands. At the annual cooperation program review meeting between DOT and the Ministry of Transport and Public Works (MOT), in-depth discussions on transport policy plans, safety, and pricing issues were held. It was agreed that the program was providing substantial benefits to both countries and should be continued and expanded. For FY 1988, the program involved technical exchanges in the areas of integrated road safety, urban and suburban congestion, and cost allocation of urban goods movement. Future cooperative efforts will include exchanges on the use of electronics to solve pricing and road congestion problems, and on methodology for determining future highway needs.

Eastern Europe. A U.S.-USSR Agreement for Cooperation in Transportation Science and Technology and two maritime operational U.S.-USSR Agreements on Search and Rescue and Radionavigation were signed during the May 1988 Summit meeting at Moscow. The general transportation agreement provides for specific exchanges in areas of aviation (navigation and communication topics, medicine, and accident investigation), rail safety, highway bridge technology, and highway/traffic safety. Major benefits are expected from working bilaterally with Soviet counterparts to develop standards and operating procedures for the interoperability of advanced aviation air traffic control and landing systems. The maritime agreements will facilitate communications between and among ships and shore stations and enhance search and rescue cooperative efforts in border waters and lead to the development of one interoperable communication system covering operations in the Bering Sea and Northwest Pacific Ocean.

DOT rail specialists have been working closely during FY 1988 with Polish rail engineers to develop a rail safety research project proposal for implementation under the 1987 U.S.-Polish Science and Technology Agreement. Significant socioeconomic benefits are expected to result from this task-sharing effort (involving theoretical calculations, laboratory tests and field test data) on rail track composition and fatigue as it would be used to form the scientific basis for an operational plan to prevent a majority of train derailments.

Other Countries. Special cooperative activities with Australia, Finland, Japan and Sweden were carried out during FY 1988. The National Highway Traffic Safety Administration (NHTSA) provided anthropometric dummies and spare parts to the government of New South Wales to improve its crash testing capabilities. The test results gathered will further expand the NHTSA crash test data base. The U.S. Coast Guard hosted separate Finnish and Swedish delegations for discussions and exchanges on icebreaker technology. The FRA continued technical exchanges with the East Japan Railway Company on privatization progress, high speed rail developments, and progress on magnetic levitation operations.

International Organizations

Transport Policy and Trade

European Conference of Ministers of Transport (ECMT). The ECMT was founded in 1953 and its membership currently comprises 19 western European countries with Australia, Canada, Japan and the U.S. as associate members. It occupies a special position both in terms of its membership and its interests which are broadly defined as technical, economic, social and political. The ECMT is concerned with the economic and commercial operation of transport services, routes, investment and such technical aspects of transport as road traffic rules, high speed rail transport, safety, and signs and signals. It also has an interest in transport and the environment, urban transport problems, cooperation among different modes and intermodal transport standardization. While not primarily concerned with science and technology, the ECMT commands the attention of high-level policy makers within transport ministries when policy decisions based on technical findings are tabled for consideration. The ECMT Council of Ministers' 1988 spring session, attended by the U.S. Secretary of Transportation, considered reports on high speed rail passenger transport, combined transport links, the introduction of lead free gas in Europe, and a proposal for a ministerial level conference on transport and the environment.

U.N. Economic Commission for Europe - Inland Transport Committee (UN/ECE/ITC). Science and technology considerations are an integral part of the work of many ITC groups during deliberations on problems of economics, safety and policy. The international harmonization of requirements for the construction of motor vehicles, for example, requires discussions among technical experts and the exchange of test results. The harmonization process ensures that standards exist for safety reasons and not as non-tariff trade barriers which would inhibit trade in motor vehicles, equipment and parts.

The ITC also discusses diverse problems of technology such as the construction, maintenance and handling of transport equipment; the development of multimodal transport; and the effect of developments in microelectronics upon transport systems. Delegates from the DOT, USDA, the U.S. Customs Service, and the EPA actively participate in the work of the Groups of Experts on Road Traffic Safety, Perishable Foodstuffs, Dangerous Goods, Construction of Vehicles, Customs Questions, Combined (intermodal) Transport, and Transport Statistics. The goal of each group has been to promote technical harmonization through the exchange of information and expertise to foster improved transport systems.

Within the ITC, the Working Party on the Construction of Vehicles (WP29) has the responsibility for the consideration and adoption of regulations, and for preparing amendments to existing regulations pertaining to motor vehicle safety,

emissions and noise. These regulations and amendments, when applied by the various member countries that are signatories to the 1958 European agreement, govern the type-approval of motor vehicles and equipment for sale in those countries. The NHTSA represents the U.S. at the sessions of WP29 and at the sessions of subgroups on crashworthiness, lighting systems, brakes and general safety provisions. During FY 1988, NHTSA pursued the harmonization of regulations on passenger car brakes, vehicle lighting systems (proposals on rear lighting and headlights), side impact protection for passenger car occupants, and participated successfully in the preparation of proposals to amend the 1968 Vienna Convention on Road Traffic.

U.N. Economic and Social Commission for Asia and the Pacific (UN/ESCAP). DOT chaired the U.S. delegation at the 11th session of the ESCAP Committee on Shipping, Transport and Communications which was held at Bangkok in December 1987. The goal of the U.S. is to urge ESCAP to adopt an integrated transport plan to accelerate social and economic development.

Maritime

International Maritime Organization (IMO). The U.S. Coast Guard (USCG) continued its active participation in IMO, representing the U.S. at meetings of the Assembly, the Council, and on committees to discuss maritime safety, marine environment protection, legal issues, technical cooperation and other topics.

The implementation by IMO members of technical security measures to prevent unlawful acts against passengers and crews on board ships was a major U.S. initiative following the hijacking of the Italian liner Achille Lauro, and the on-board murder of a U.S. citizen. Security measures, drafted by the USCG, were introduced, finalized and adopted by the IMO in less than one year after the incident. Since the terrorist attack on the Greek cruise liner the City of Poros, the U.S. has called for an IMO review of the security measures to determine if any lessons learned from this incident should be used to strengthen security.

IMO agreed to a U.S. initiative to develop more uniform and comprehensive requirements for damage stability of passenger vessels. The requirements will improve the probability that ships will survive serious damage and that, if necessary, abandonment could be conducted well before the vessel is likely to sink.

Major changes are being proposed for the 1974 Safety of Life at Sea Convention and the 1973 Marine Pollution Convention and Load Line Convention requirements regarding survey and certification. These changes will strengthen requirements and harmonize the inspection intervals so as to reduce disruptions to vessel service.

Preparations continue for holding an international conference on the Global Maritime Distress and Safety System which will improve markedly the capability of mariners to communicate with each other and, more importantly, with shore-based rescue facilities.

Long-term negotiations to develop a new international salvage convention under IMO auspices are nearing fruition. The new convention, which would replace the 1910 Salvage Convention, provides added incentive to assist vessels in distress.

Aviation

International Civil Aviation Organization (ICAO). The Federal Aviation Administration (FAA) continued its active representation in ICAO at Annual Assembly meetings. Regional Groups and other committees and panels set up to study specific problems and issues on international aviation development and operations. During FY 1988, the FAA participated in major international conferences such as the Diplomatic Conference on Anti-terrorism which works to develop an international convention involving acts of terrorism at international airports; the African Regional Air Navigation Plan meeting for developing aviation system improvements; and Future Air Navigation Systems Committee meetings for fostering the design and implementation of the next generation of international aviation communication, navigation and surveillance systems. The FAA also participated in the development of the Aviation Security Plan to improve methods, procedures and training aids for passenger/baggage screening and airport/carrier security.

Highway Construction and Highway/Traffic Safety

The International Road Federation (IRF). In cooperation with the private sector, FHWA is preparing an exhibit for the Eleventh IRF World Meeting at Seoul, Korea, in April 1989, to demonstrate the capabilities and availability of American highway technology, services, equipment and materials. FHWA also is cooperating with the IRF to publish the "International Compendium of Highway Training and Technology Resources for Developing Countries," scheduled for publication in 1990.

Pan American Highway Congress (PAHC). FHWA has agreed to develop the framework for a Pan American Institute of Highways at the request of the PAHC Permanent Executive Committee. Its objective is to establish an autonomous, self-sustaining, independently financed and viable institution to provide training and technology transfer services to PAHC members.

Permanent International Association of Road Congresses (PIARC). The PIARC is the principal international road policy and technical organization benefiting public sector road authorities. FHWA expanded its participation in PIARC in 1987 to improve domestic highway practices in developed countries, and to promote the exports of U.S. suppliers of road equipment and services. In 1988 FHWA representatives attended technical committee meetings entitled Roads in Urban Areas and Pavement Technology and planning meetings for the next World Road Congress to be held in Morocco. Technical benefits have been gained in pavement and traffic management areas, and DOT participation has increased international awareness of American innovations.

International Commission on Illumination (CIE). The CIE is a private international organization founded in 1900 to provide an international forum for discussions and exchange of information on all matters relating to the science and art of illumination. The membership is composed of 29 affiliated national illumination committees, including one which develops reports and guidelines on highway and vehicle lighting and visual signaling. Under consideration is a proposed "Guide for Lighting of Road Tunnels and Underpasses" which varies from American standards. Reconciling and upgrading U.S. standards according to the proposed international standards may be more costly, but it will increase international trade and safety.

Organization for Economic Cooperation and Development - Road Transport Research Program (OECD/RTRP). The RTRP was created in 1967 to provide scientific and technical support to member governments and to assist them in making decisions on roads and road transport. The RTRP also promotes cooperation

through the consolidation and exchange of information. These purposes are accomplished through a triennial program of multilateral research and the International Road Research Documentation (IRRD) Program, which is a computerized scheme for the systematic exchange of scientific and technical literature.

The RTRP is the major forum for the exchange of information on policies and technology among the industrialized countries of western Europe, North America and the Pacific region. The program also takes into account other modes of transport and broader socioeconomic concerns. Each research group is led by a pilot country that has the greatest expertise in the selected subject and is charged with providing a background paper, guidance and leadership throughout the cycle of work. The maximum quantity of research results at the lowest possible cost are therefore realized.

The scientific and technical activities of the triennial program for 1986-1988 cover a wide range of topics within the general categories of road infrastructure, road traffic control and driver communication systems, road and traffic safety programs, urban and interurban road transport, and transfer of technology to developing countries.

DOT representatives participated actively in RTRP groups considering topics of special interest and benefit to the U.S. During FY 1988 these were: (1) International Coordination of Full-scale Simulations of Pavement Traffic Loading, (2) Pavement Damage due to Heavy Freight Vehicles and Climate, (3) Durability of Concrete Road Bridges, (4) Optimum Allocation of Road Funds for Maintenance and Rehabilitation Programs, (5) Traffic Control and Safety Improvements at Highway Work Zones, (6) Road User Capacities and Behavioral Adaptations in Adjusting to Changing Traffic Tasks and Accident Risks, (7) Driver Information and Guidance Systems Using In-vehicle Communication Systems, and (8) Curtailing Salt Usage in Winter Maintenance. Reports on these studies will prove especially useful as they will lend an international perspective to the analysis of some of the most pressing U.S. national highway issues.

Rail

International Union of Railways (UIC). The Federal Railroad Administration (FRA) continued participation in the activities of the UIC, particularly in the work of its Office for Research and Experiments (ORE). Through its specialist committee structure, the ORE studies questions of mutual concern to UIC member railway entities. In exchange for results of U.S. rail research, FRA received reports on foreign research on such topics as track design and maintenance, rail car and component designs and load factors, rail track buckling (e.g., the longitudinal rail stress phenomenon involved in the use of Continuous Welded Rail), and rail track fatigue which were highly complementary to U.S. priorities. FRA specialists participated in the work of an ORE Committee established to develop scientific methods to measure the fatigue phenomena associated with the contact of steel wheel loads on rail.

Dangerous Goods Transport

U.N. Economic and Social Council (ECOSOC) - Committee of Experts on the Transport of Dangerous Goods. This U.S.-chaired committee is concerned with the development and harmonization of regulations and recommendations for the safe and efficient international transport of dangerous goods other than radioactive materials. The committee considers highly

technical subjects such as proper classification and packaging, hazard evaluation, testing methods, and the use of multimodal tank and intermediate bulk containers for the transport of explosives and other dangerous goods. A number of recent amendments to the DOT Hazardous Materials Regulations incorporate transport standards developed through participation in the work of the committee and other international organizations. Such action is consistent with national law which requires agencies to base regulations on internationally developed performance standards. As the U.S. currently enjoys a positive trade balance in chemicals, our commercial interests are well-served by adopting accepted standards.

Special Multilateral Programs

Strategic Highway Research Program (SHRP). The SHRP is an international program for improving highway infrastructures of participating countries. Funded under the auspices of the National Research Council in cooperation with FHWA/DOT and other U.S. transport entities, technical problems regarding both materials and processes are being researched and procedures for continuing international cooperation have been established. To gain access to foreign research expertise and to foster cooperation, SHRP has created special one-year term positions for foreign researchers.

Experimental Safety Vehicles (ESV). Initiated in 1970 under the NATO Committee on the Challenges of Modern Society, the ESV program involves nine countries. Current emphasis is being placed on the broader issues of motor vehicle safety rather than on the original thrust of developing state-of-the-art safety design and engineering. NHTSA has been actively engaged in planning for the 12th ESV Conference to be held in Sweden in 1989. Benefits include early introduction of technical improvements in vehicle design to promote vehicle safety, reduction in costs to individual countries of research, international harmonization of safety improvements, and close working relationships with government and industry specialists worldwide.

Amtrak Passenger Equipment Tests. The FRA has been participating in non-destructive Amtrak tests of rail passenger equipment between Boston and New York, which included trial runs of Spanish and Canadian tilt body cars loaned to Amtrak at no cost. Amtrak will conclude its program after testing other types of equipment and analyzing results for comparison.

Caribbean Basin Initiative (CBI). During FY 1988, DOT continued to support CBI activities including the organization of a session of the CBI at the 14th International Forum for Air Cargo, shipment of surplus hospital supplies to Haiti, and dialogue with private sector organizations concerning transportation training needs of the region. Efforts are being made to involve the Organization of American States (OAS), the World Bank and the International Association of Ports and Harbors in funding port and maritime training in the Caribbean.

Marine. The U.S. Coast Guard (USCG) entered into Search and Rescue (SAR) agreements with the Federated States of Micronesia and with Indonesia. These agreements will enhance cooperation by improving communication and sharing of operational and training information in that region. In cooperation with the Mexican navy, the USCG conducted a joint pollution response team exercise to test procedures established under the U.S.-Mexico Agreement for Protection of the Marine Environment.

Technical Assistance

Cost-reimbursable aviation technical assistance in all areas which affect safety (i.e., air traffic control and air navigation facilities, airmen licensing, airport operation, security, and airworthiness) is provided by the FAA through formal agreements with foreign government aviation entities. During 1988, FAA carried out the program under 178 Memoranda of Agreements with 66 countries and organizations throughout the world. The safety of both American and foreign carrier operations are greatly enhanced by this program.

U.S. Coast Guard officers are assigned as consultants and support staff to many countries and international organizations (e.g., U.S. Mission to the United Nations, the IMO, and the Panama Canal Commission) to provide technical assistance in maritime safety, maritime law enforcement procedures, and disaster preparedness with emphasis on port safety, search and rescue, oil spill contingency plans, and cruise ship disaster contingency plans.

The FHWA carried out cost reimbursable technical assistance programs with Kuwait, Barbados, Costa Rica and Indonesia. Work ranged from planning a modern transport system to specific assistance on highway construction, traffic planning, and conducting workshops on value engineering. Exposure to American industrial capabilities enhances possibilities for exports of highway technology and equipment.

Specialists in the Office of the Secretary (OST) at DOT continued to manage the large (about \$3.3 million in FY 1988) Saudi Arabian cost-reimbursable technical assistance program in order to carry out the goals established in 1978 with the Saudi Ministry of Communications. These goals include the development of a modern transport system, training of professionals in transport technology, transfer and tailoring state-of-the-art technology to Saudi needs, enhancement of the overall administration of transport, and providing staff and equipment support in critical areas such as data processing.

OST also provides cost-reimbursable experts to the USAID for various assignments in developing countries. At the request of USAID, a DOT economist assisted the government of Jamaica during 1988 in implementing plans for the construction and maintenance of a 450-mile farm-to-market road program. As part of a continuing DOT-USAID effort, strategies for development of transport in southern Africa were prepared to make freight transport in the landlocked countries less dependent upon South Africa by rehabilitating portions of the traditional regional transport corridors and by improving the efficiency of transport in the region.

Training of Foreign Nationals

DOT provided aviation, maritime and highway training to foreign nationals, primarily on a cost-reimbursable basis as follows:

- FAA programmed training at U.S. facilities for 343 international students in FY 1988. Several classes, including subjects such as air traffic control, flight standards and instructor training, were conducted exclusively at the FAA Academy at Oklahoma City. Other training for various specialties is arranged at U.S. schools and businesses. Total tuition value of this training exceeds \$650,000.

The U.S. Coast Guard Academy now has a total foreign student enrollment of 11 from Central America and South America and the Pacific regions. As space is available, foreign students can attend Coast Guard schools on a reimbursable basis, or when sponsored by another federal agency. During FY 1988, approximately 100 foreign students attended Coast Guard schools under the U.S. Security Assistance Program. Another 50 attended under various U.S. foreign aid programs, international organization sponsorship or through direct reimbursement from the sending country. The Coast Guard also dispatches Mobile Training Teams to foreign countries to provide training in USCG related missions (e.g., drug law enforcement, fisheries law enforcement, port safety and security, and search and rescue). Eighteen foreign students are enrolled currently at the U.S. Merchant Marine Academy at Kings Point. Seventeen of the students (15 from Panama, one from Venezuela and one from the Philippines) attend on scholarships and the remaining Panamanian student is paying his own way. Cost per year per student is estimated at about \$5,000.

At the request of the government of Indonesia, 29 of its highway engineers were placed in state highway agencies for six weeks of on-the-job training in American procedures for highway planning, construction and maintenance. The FHWA conducted three training seminars in Indonesia on the application of value engineering.

Foreign Visitors

In addition to discussions with visiting foreign counterparts on bilateral cooperations, DOT hosted approximately 1,450 visitors from all over the world during FY 88 for discussions on U.S. transport technology, transport system planning, institutional arrangements, regulation and deregulation, safety, and security. Aviation and maritime were the modal areas of greatest interest.

Budget and Resources

During FY 1988, costs for carrying out DOT international activities are estimated at \$15.5 million. Costs must be estimated as many international functions also serve to fulfill national missions of the DOT or cover expenditures for a variety of purposes including promotion of international operation. The Department does not have a separate appropriation for carrying out international science and technology programs. All costs are absorbed in budgets of the various departmental entities.

CHAPTER 3: BILATERAL SCIENCE AND TECHNOLOGY COOPERATION

ARGENTINA

Cooperative activities with the U.S. indicate Argentine competence in diverse areas of science and technology, from biosciences to geosciences, from nuclear energy to space. Much of this cooperation occurs under the 1972 government-to-government agreement, which was renewed in 1987. At that time, the Argentine side emphasized the foreign-policy importance it attached to the agreement by requesting a more active coordinating role for its Ministry of Foreign Affairs.

Argentina continues seeking to build an S&T program consistent with its past accomplishments and capable of meeting future challenges. Tight budgets hold down salaries and limit equipment purchases and travel; national expenditures last year were about 0.5 percent of gross domestic product. Development of a broadly-based Argentine science sector, with links to the more developed democracies, contributes to the consolidation of democracy in Argentina.

Argentina's location and geography as well as its capabilities and self-interests have led recently to enhanced cooperation with the U.S. in the geosciences: seismic prevention, polar magnetism and gravitation, and the causes and effects of stratospheric ozone depletion, especially seasonal fluctuations in the ozone hole over Antarctica. Joint Antarctic and environmental research increases common understanding bearing on political and economic issues such as limits on chlorofluorocarbon production and territorial or resource claims on the polar continent. A joint biomedical project led to a vaccine now immunizing Argentines against hemorrhagic fever. Argentina has proposed building a solar physics satellite (SAC-1) to be launched in the U.S. Findings derived from this project would be shared. Project planning since 1984 has reduced the military component in favor of civilian control of most S&T activities.

The U.S. continues both nuclear dialogue and nuclear cooperation with Argentina. Since Argentina does not adhere to a non-proliferation treaty, some areas of cooperation are off-limits under the terms of the U.S. nuclear non-proliferation act. Joint work takes place in operation of research reactors with low-enriched fuel and basic nuclear studies. The regular exchange of views on nuclear policy between the two governments (most recently at Buenos Aires in March 1988) continues to sharpen and clarify the range of constructive dialogue.

Difficulties in access to Argentine facilities by U.S. scientists is based primarily on political rather than scientific grounds, except in the area of nuclear research. The 1969 Nuclear Cooperation Accord predates the general S&T cooperation agreement, and activities under the accord are at a low level due to provisions implemented under the 1978 U.S. nuclear nonproliferation act, which restricts cooperation with countries that are not a party to an international nonproliferation agreement. Political questions also have arisen over the participation of British citizens in some U.S. funded research projects, especially in the area of the Falkland Islands.

BRAZIL

The centerpiece of scientific cooperation between the U.S. and Brazilian governments remains the Science and Technology Initiative (STI) announced by President Reagan and President

Saney in 1986. The STI is aimed at stimulating mutually beneficial research in the broad disciplinary areas of biomedicine and agriculture, oceanography and meteorology, alternate energy sources, ecology and environment, engineering and materials sciences, and basic science. Preparation is proceeding to define research plans in each of these six research areas for presentation to the U.S.-Brazil Joint Commission. This commission, established under the umbrella S&T agreement between the two governments, is to meet to receive these reports and launch actual collaborative activities. These activities will benefit from seed monies appropriated by the U.S. Congress (\$2 million) and the Brazilian Congress. Implementation of the STI has been complicated by trade tensions between the U.S. and Brazil in the areas of computer products and pharmaceutical patents.

CANADA

Canada has continued to put emphasis on an S&T strategy designed to build the basis for Canadian competitiveness in the world economy. This strategy includes a series of initiatives within a framework termed "innovation":

- Additional funding for Canada's space program;
- A federal microelectronics strategy designed to assist Canadian industry in developing and applying advanced microelectronic technologies;
- A biotechnology strategy, concentrating on support for recombinant DNA projects and establishment of networks between performers and users of research;
- Expanded programs to promote technology transfer from federal laboratories and universities to Canadian industry; and
- Increased funding for S&T scholarships and public awareness programs.

In January 1988, \$1.1 billion (U.S.) in new funding was approved by the Canadian government to implement these programs. The space program has been allocated an additional \$164 million, and \$165 million is being added to the budgets of Canada's research granting agencies. A large share of the new funding has not yet been committed.

Canada announced in April 1988 its decision to participate in the space station program. The Mobile Servicing System (MSS) which Canada plans to contribute will entail budget outlays of about \$1 billion, making this the largest on-going S&T project in Canada. The MSS, which will play a vital role in assembling the space station and in servicing and manipulating payloads such as satellites, is proudly regarded in Canada as a measure of the nation's technological maturity. Space station participation has been promoted as one of the major initiatives in Canada's innovation program. A strategic technology automation and robotics program has been set up to help industry exploit the technologies developed for the MSS, and this program already has started making grants to Canadian companies.

The past year has witnessed an expansion of U.S.-Canada cooperation in energy research and development. Within the framework of the new energy MOU between DOE and Canada's Department of Energy, Mines, and Resources, cooperative projects have been initiated in gas hydrates, coal/heavy oil

co-processing, high-power lasers, alternative transportation fuels, solar technologies and other fields. DOE also concluded an agreement with Atomic Energy of Canada Ltd (AECL) for cooperation in fusion energy research, and has continued its research cooperation with AECL in high energy nuclear waste management. Canada has expressed interest in the SSC project and is presently conducting a review to determine whether to participate.

Extensive interaction takes place between the research communities in the U.S. and Canada, and Canadians generally look to the U.S. as a partner in undertaking new S&T programs. Canada has at the same time sought to broaden its scientific and technological contacts with other countries. Among its more significant recent actions, Canada has concluded an S&T cooperation agreement with Japan, explored space science cooperation with the Soviet Union, and strengthened its cooperative science links with France. Taking a special interest in the Arctic, Canada has expanded its Arctic research cooperation with the Soviet Union, and is exploring with the U.S. and other Arctic nations establishment of a multilateral framework for scientific collaboration in the Arctic.

The Canadian government has continued to give prominence to environmental issues reflecting the high level of public concern in Canada over the state of the environment. On the domestic front, the Canadian Environment Protection Act was enacted, providing a broad new regulatory framework for federal and provincial action, and more stringent automobile emission standards comparable to those in the U.S. were put into effect.

In June 1988, Canada hosted a major world conference on climate change which focussed attention on the greenhouse effect and on measures to slow the climate warming process. The U.S. did not accept the recommendations given by the conference because current scientific understanding does not support the conclusions reached.

Acid rain has remained at the forefront of the Canadian public's concern over the state of the environment. Rightly or wrongly, many Canadians believe that acid rain is causing widespread damage to forest and aquatic systems, as well as endangering public health and damaging buildings and monuments. Many believe U.S. emissions are the major source of this acid rain, and place blame on Prime Minister Mulroney for failing to obtain a commitment from the U.S. to place controls on sulfur dioxide emissions. They are skeptical that the U.S. clean coal technology demonstration program will have much impact in the absence of tight emissions controls, and they give little weight to the economic costs of a control program relying upon present technology. In these circumstances, acid rain has remained a major irritant in the U.S.-Canada bilateral relationship.

Science and technology cooperation between the U.S. and Canada has been mutually beneficial. U.S. public and private research institutes as well as industrial researchers have enjoyed equitable access to public research facilities in Canada and to private facilities receiving public support. Recent free trade agreement negotiations did not reveal any areas in which equitable access to Canadian research facilities is constrained. Intellectual property rights are, in general, properly protected under Canadian law. The U.S. has encouraged Canadian legislation to improve the protection of the topography of software used in semiconductor design. Further steps are being taken to ensure the protection of U.S. access to research within S&T cooperation accords with Canada.

CHILE

U.S.-Chile scientific cooperation has increased in part, as the result of an American Association for the Advancement of Science (AAAS) visit made in May 1987. One concrete result was the incorporation of Chile into the Bitnet University computer network in December 1987. This connection was made under the auspices of Article XIX of the Mataverí agreement signed in 1985 between NASA and the government of Chile. NASA was instrumental in making the Bitnet connection; this is an excellent example of innovative scientific cooperation in a period of limited resources. All major Chilean universities are linked together through the Chilean academic computer network, and they are using the University of Chile as the local node to communicate with university colleagues throughout the Bitnet system in the U.S., Canada, Mexico, Japan, Europe and Israel. The use of Bitnet in Chile is expected to increase even further as the result of a hardware and software standardization program currently carried out by the University of Chile, IBM-Chile and the local agents of other U.S. computer suppliers.

NASA involvement with the Chilean scientific community after the "1987 - Airborne Ozone Experiment" has remained strong. Dr. Margarita Prendez, a chemist, spent two months conducting joint research with NASA scientists at the Ames Research Center in California. This joint research was made possible by financial support from the U.S. Chemical Manufacturers Association.

With coordination support from the U.S. Embassy at Santiago, EPA has established an informal cooperative effort with the Metropolitan Intendency (regional government) of Santiago concerning the growing air pollution problem affecting Chile's capital. EPA scientists visited Chile in March 1987 and March 1988, and have assisted a number of Chilean universities as well as public and private agencies in mathematical modeling and optimization techniques. In an effort to formalize this cooperation, the Metropolitan Intendency will sign a request for the Inter-American Development Bank to fund a three-year cooperative program between the EPA and the Metropolitan Intendency to assist the air pollution monitoring program.

NOAA and the Chilean Hydrographic Institute jointly organized the Tsunami Hazard Reduction Using System Technology (THRUST) workshop in June 1988. With the financial support of USAID/OFDA and the expert support of NOAA, the workshop brought together a number of Tsunami experts from most of the Latin American Pacific Basin countries. Results of NOAA's cooperation with and the Institute on a two-year USAID-funded project concerning the development of an early warning system for Tsunami's were discussed.

As a consequence of Article XIX of the NASA Mataverí agreement with the government of Chile, the third meeting between NASA and the Chilean space committee took place at Washington in July 1988. New cooperative projects regarding research programs in astronomy, oceanography and remote sensing were discussed. A proposal also was made to consider the launch of a Chilean amateur radio satellite as part of a future NASA launch to promote greater awareness in Chile of the use of space.

The NSF, through its polar programs division, is planning more active participation with the Chilean Antarctic scientific community.

USGS continues its traditional involvement with Chilean geologists and seismologists. In August 1988, the University

of Chile received a donation of a USGS-funded research computer to enable it to compile a seismic map of Chile which will contain detailed information on earthquake risk zones. USGS also is working with Chilean seismic engineers to revise Chilean building standards to reduce the potential damage from future earthquakes. Finally, USGS conducted a regional seminar on marine geology during March 1988.

The Colorado School of Mines (CSM) is engaged in an active program to promote technical cooperation and technology transfer between the CSM and Chilean universities. This program is conducted through its Latin American Center for Minerals and Energy Development, with the assistance of a special grant from USAID. A professional exchange and a two-year series of special CSM course offerings in Chile already is underway with the University of Antofagasta. Similar programs are being developed with the University of La Serena and other universities with mining and metallurgical engineering interests. If this pilot program with Chile is successful, it could be repeated in other Latin American countries.

The U.S. and Chile have a long tradition of bilateral cooperation in the marine sciences. The many U.S. research vessels conducting oceanographic and marine geology research in Chilean waters frequently have Chilean scientists on board, either as observers or as researchers. This cooperation provides Chilean scientists with a working platform to conduct their own research or to learn from the research already in progress.

Despite the increased cooperation provided by these above activities, there is still a significant gap between the degree of cooperation which existed in the past and that which exists today. As a result of the coup which brought a military government to power in Chile in 1973, many of the cooperative programs and scholarships that once made it possible for Chilean scientists to be trained in the U.S. no longer exist. Consequently, there is a whole generation of younger Chilean scientists who have stronger ties with western Europe and Asia than with the U.S., jeopardizing the future of the longstanding ties between the U.S. and Chilean scientific communities.

From the research point of view, Chilean legislation protects intellectual property rights. However, the law has been inadequate until recently in protecting computer software and pharmaceuticals. The government of Chile recently amended the existing law in order to protect computer software from piracy and unfair trade; to date, the effects of the law appear satisfactory. Chilean law concerning pharmaceutical rights were written almost 50 years ago, and recent actions portend an improvement in this area within the next couple of years.

PEOPLE'S REPUBLIC OF CHINA

The year 1988 marks the completion of the first successful decade of the government-to-government cooperative S&T program which began immediately after the normalization of diplomatic relations between the U.S. and China in January 1979. Over that first decade, the steadily expanding cooperation has constituted the largest bilateral S&T program for both governments in terms of scope and diversity, numbers of scientists and engineers involved, and resources committed by each side. Each year, hundreds of scientists and engineers are engaged in long-term collaborative research, the exchange of scientific and technical data, visits to each other's research facilities, and holding of seminars. The fields of cooperation

range widely, from earthquake studies to coal technology and from high-energy physics to cancer research, within the framework of nearly 30 agency-to-agency agreements. As the program has matured, there has been a steady trend toward longer-term collaboration oriented toward joint research, more extensive two-way flow of data and information, and an increasing number of joint publications in international scientific journals. Paralleling the growth of the governmental programs, private sector exchanges and cooperation also have flourished. While no precise measures are available, those activities sponsored and organized by universities, professional societies, private foundations, corporations and other organizations are believed to substantially exceed the government-to-government programs. The governmental and non-governmental sides of the U.S.-China S&T relationship often have been mutually complementary and have stimulated each other's growth.

The nature of the U.S.-China S&T program has evolved considerably over its first decade. In its initial stages, the program was viewed as a major vehicle for cementing the newly established diplomatic relations between the two countries. Now, a decade later, the continued growth of the program is driven primarily by the scientific interests and benefits of cooperation which participants of both sides already have achieved or perceive in the near-term. The attendant growth of private sector cooperation further attests to those scientific interests. In many areas, the scientific benefits of cooperation have derived from joint analysis of data gathered in China: geologic, atmospheric, seismic, oceanographic, epidemiologic. These data are often unique to China or derive from China's large territorial expanse. Gaining access to such information has served to fill major gaps in global databases. In other areas, such as biochemical and astronomical research, the effective intellectual melding of scientists with different approaches to a common problem has led to new accomplishments. Although difficult to quantify with precision, the commercial benefits to the U.S. of S&T cooperation with China also should be noted. Some of the agreements have led directly to the purchase of millions of dollars of U.S. scientific instrumentation. In general, exposure to equipment resulting from collaboration with and in U.S. laboratories can be expected to give U.S. products an extra boost in the Chinese market. Although, ultimately, sales often are affected most by the concessionary financing and more relaxed export licensing practices of some of the United States' competitors.

Despite the rapid increase in the value of S&T cooperation for its own sake, the government-to-government program retains substantial political importance to this day. Amid the political and economic frictions which have occurred periodically between the U.S. and China over the past decade, the large and tangible S&T program has served as a balance providing significant stability to the overall relationship. Celebration of 10 active and successful years of S&T cooperation can be expected to be an important symbolic element as the U.S. and China celebrate the first decade of normalized diplomatic relations.

Major trends on both sides of the Pacific have contributed to the growth of the U.S.-China S&T relationship. Over the past decade the U.S. government has devoted increasing attention to the development and management of international, intergovernmental cooperation in science and technology, and has recognized the importance of the S&T dimension in the web of global economic interdependence. During that same time period, following the devastation of intellectual resources

during the "cultural revolution," China has identified the critical need to rebuild its research and educational infrastructure in order to pursue its economic reform and development strategy. China also has recognized the need to open its doors wide to international S&T cooperation as part of that rebuilding process.

Reforms in China, begun in 1978 and accelerated since the mid-1980s, have enhanced the value to the U.S. and other countries of S&T cooperation with China. Among these the following should be cited: The training and retraining of a new generation of scientists, over 50,000, half of these in the U.S., a major upgrading of China's top research facilities through extensive acquisition of new equipment; dramatic improvement in the openness and availability of scientific information; and bold experimentation with new organizational and funding programs for research and development, more compatible with forms found in the West. Examples of this last point include establishing competitive funding structures such as the National Natural Science Foundation of China and creating "open" laboratories which encourage the hitherto nonexistent mobility of scientists. As a result of this transformation, the number of opportunities for U.S. scientists and engineers to collaborate with Chinese colleagues is growing at a prodigious rate.

Also noteworthy is the commonality of S&T policy concerns between the U.S. and China which has emerged and sharpened over the past two or three years. Both countries have pinpointed the vital importance of transferring laboratory efforts into production. Whether the underlying issue is labeled "economic competitiveness" or "economic development," policy-makers on both sides are seeking to forge better ties and transfer mechanisms between R&D institutions and industry and to enhance the economic benefits of relatively limited R&D resources. The drive for commercialization of research in China, encouraged by national policy, has reached a fever pitch since the fall of 1987. This is causing dramatic changes in the landscape of China's R&D sector, presenting major challenges and opportunities for China's international partners. The recent emergence of hundreds of high-technology companies, in an emulation of "silicon valley", may represent an opportunity to forge bilateral ties of immediate commercial as well as scientific benefit for U.S. laboratories and companies. At the same time, the increasing institutional complexity of China and the steady decentralization of decision-making authority to the level of individual research laboratories and production enterprises has intensified the need for the U.S. to sharpen its ability to identify new bilateral cooperative opportunities. Looking to the future of the overall S&T relationship, the U.S. can anticipate increasingly rapid growth as China continues to emphasize the development of its own S&T sector and as its research accomplishments move steadily to world-class levels. That domestic trend can be expected to generate even greater Chinese demands for international cooperation. The U.S. is likely to remain one of China's preferred partners despite China's expanding ties with western Europe, the Soviet Union and the Eastern Bloc. On the U.S. side, the research communities will continue to find steadily increasing benefits in collaborating with China's dynamic R&D enterprise.

Three issues are likely to dominate as the relationship matures:

- (1) As the relations on the private side expand and intensify, the role of the government-to-government program will have to be constantly reassessed to ensure maximum

catalytic effect on private sector relations as well as to ensure the particular scientific needs of, and benefits to U.S. researchers.

(2) The management of the relationship, both public and private, will continue to face the need to ensure the national security concerns of the U.S. China's rapidly improving technological capabilities will raise the level of Chinese expectations toward further transfers. At the same time, China's growing ability to produce increasingly high levels of technology may make other areas of technology transfer a moot issue.

(3) Especially because both governments are actively encouraging the commercialization of research, the protection of intellectual property looms large on the horizon. This is a significant issue in China's domestic context, and China is moving steadily toward establishing its own legal and regulatory system of intellectual property rights (IPR). At this stage, however, the system is still embryonic and mismatched with our own. The U.S. is actively encouraging Chinese efforts in the IPR area, and discussions specifically related to the protection of intellectual property emerging from S&T cooperation have been under way in 1988.

U.S.-China S&T cooperation is overseen by a joint commission, chaired on the U.S. side by the President's Science Advisor. The commission, which meets approximately every two years, is scheduled to meet next at Washington in 1989. It is expected that the meeting will appropriately symbolize the beginning of a second decade of S&T cooperation of ever expanding technical, commercial and political benefits to both countries.

EGYPT

U.S.-Egypt science and technology cooperation is conducted under a bilateral agreement signed in 1981 and renewed in 1986. Ongoing projects include archeological research, environmental programs and the activities of a U.S. Navy medical research unit at Cairo. Since 1987, the principal focus of bilateral S&T cooperation has been on USAID-funded projects. In FY 1988, a total of \$98.5 million was committed with \$50 million of the total to energy conservation, \$40 million to research into schistosomiasis, \$8.5 million to energy manpower training.

S&T cooperation is an integral part of the U.S.-Egypt relationship. Development is Egypt's primary economic concern and the U.S. can contribute scientific and technological expertise to the Egyptian development effort. Energy conservation, for example, will enable Egypt to better utilize its energy resources and maintain its exports of crude oil which have been a major foreign exchange earner in an economy faced with a foreign exchange constraint. At the same time, the medical research effort will benefit both nations, as well as other countries in the region.

Egypt offers U.S. scientists and researchers generally open access to Egyptian facilities. Foreign researchers must have a sponsoring Egyptian institution, but normally this is not difficult to arrange. In recent years, the government of Egypt has begun the process of removing barriers to cooperation between Egyptian public institutions and the private sector, both domestic and foreign. This has led to the expanded use of Egypt's public laboratories by private companies.

FINLAND

In 1985 the U.S. and Finland concluded an umbrella government-to-government S&T agreement and eight interagency agreements have been signed over the past six years. On the U.S. side, participation includes NRC, NSF, DHHS, DOE, DOT and the U.S. Army and its Corps of Engineers. The agreements are well regarded by both governments and have expanded and strengthened U.S. official contacts with key elements of the Finnish S&T community as well as with government and education leaders.

Although Finnish S&T is well respected in the U.S., the level of scientific cooperation between the two countries is modest. The Finnish government has tried to increase the activity by publicizing Finland's scientific capabilities and by urging the U.S. to make the bilateral relationship more structured. In September 1988, for example, the Finnish Ministry of Trade and Industry was a major sponsor of and participant in the Energy 2000 Symposium held in Wilmington, Delaware.

U.S. government agencies, public and private universities, and a variety of U.S. private companies have S&T relationships with their Finnish counterparts and obtain free access to Finnish facilities. U.S. scientists and engineers participate in cooperative research projects, and frequently attend conferences and seminars at the invitation of their Finnish counterparts.

FRANCE

The U.S. and France regard S&T cooperation and competition as integral to their economic, political and security relations. These interests are typified by major negotiations through the European Space Agency (ESA) projects on breeder reactors and fusion energy, health issues such as AIDS, and ozone-layer depletion. Discussions about the Strategic Defense Initiative (SDI) and the European Eureka Program are of continuing mutual interest.

Joint activities of note in areas of French expertise include space, high-energy physics, biomedicine, nuclear energy and other fields. A large number of U.S. agencies cooperate directly and indirectly with French scientists through interagency and project agreements. NSF conducts joint research, staff exchanges and seminars. NASA and NOAA cooperate in large scale activities that yield complex essential data from space-based atmospheric, terrestrial and oceanographic research. There is an acute awareness in France that the economic--and thus social, political and security--future depends in part upon being technologically competitive. France assigns priority to advanced telecommunications, computer software and electronics, space and aviation systems, and biotechnology. Each of these has improved French industrial prosperity significantly. There is particularly active French interest in the U.S. experience in university and industrial research and innovation. An agreement finalized in 1986 establishing Franco-American cooperation in entrepreneurship and technology development, supported by nongovernment funds, has stimulated great interest and initiative on the part of technology-based small and medium-sized U.S. and French firms. Over 100 such firms in France have expressed interest in joint ventures with U.S. counterparts. Similar enthusiasm has been evidenced by U.S. firms.

Increasingly intensive collaboration has taken place in research and development on AIDS. Joint projects through the U.S.-French AIDS Foundation have been developed which focus on the AIDS-related problems of developing countries, particularly those in Africa. Exchanges of data and joint research between France (e.g., the Pasteur Institute and the National Institute for Health and Medical Research) and the U.S. (e.g., NIH) have evolved positively since the resolution of AIDS test kit patent disputes in 1986.

In an extensive review of nuclear electric generating technology, the French have reaffirmed their confidence in the light water reactor, expecting it to remain the major component for electricity generation in France well into the next century. Exchanges between U.S. and French experts on nuclear reactor safety, more intense after the Chernobyl disaster, continue to be extremely useful. In general, there is more information available on French reactor operating experience at present than before Chernobyl. The French, in reemphasizing the importance of their light water reactors, which supplied approximately 80 percent of French electricity in 1987, have noted that fast breeder reactors are not expected to make a significant contribution to electricity generation until well into the next century.

Much of the space cooperation between the U.S., France and other European countries now is channeled through the European Space Agency (ESA). In a major step for U.S.-European space cooperation, ESA approved and funded in 1987 the entire range of activities for its participation in the U.S.-led international space station effort. This includes the European-supplied attached pressurized module for the station and the polar platform for earth observations. Led by France, ESA also approved the Hermes space plan and the Ariane V space launch vehicle. The successful conclusion of the space station agreement will be a major milestone in U.S.-French space cooperation. France, as the European leader in space, has much to gain from this program, as does the rest of Europe. In addition to providing the U.S. and Europe with a fully capable, permanently manned space station in low earth orbit, the cooperation strengthens western partnership at a time of increasing Soviet overtures to Europe for expanded cooperation in this vital area.

The U.S. and France generally agree on the need to protect intellectual property and to ensure symmetrical access to research and development facilities and opportunities. France has been a leading advocate of international fora on strengthening intellectual property protection, and considers including specific protective language in cooperative S&T agreements on a case-by-case basis.

FEDERAL REPUBLIC OF GERMANY

The Federal Republic of Germany (FRG) is one of the closest partners of the U.S. in science and technology. Over 20 bilateral agreements for cooperation have been concluded, linking agencies of both nations. There are about 200 agreements of various kinds among universities and institutions. An estimated 5,000 to 6,000 American scientists a year go to the FRG on exchange visits, with a similar number of Germans coming to the U.S.

This high level of cooperation is due not only to the ability of most German scientists to work in the English language, but also to the eagerness of German researchers and institutes to work with their American counterparts. Clearly,

American science and technology is held in the highest regard, and an opportunity to work in the U.S. for one or two years is considered a valuable component of a scientific career.

From the U.S. point of view, the FRG is an attractive partner because of the quality and depth of its scientific capabilities and achievements. The FRG expends over \$30 billion a year on research and development, roughly 40 percent more than either France or England, and ranks third among the industrialized countries. In addition, in fundamental research where cooperation is most intense, Germany is especially strong. Whether in Germany's decentralized university system or in the more than 50 Max Planck Institutes, German scientists are well-funded, well-equipped and well-regarded. One measure of their success is that in the last three years, German scientists have won the Nobel Prize in physics. Another is that schools of engineering and science seem to have no trouble attracting qualified and motivated students.

The best example of the close partnership between the U.S. and the FRG in science and technology comes in the exploration of space. A major event in the history of space cooperation came in 1988 when agreement was reached for the participation in the U.S. space station by Canada, Japan and the member nations of the European Space Agency (ESA). By virtue of its being the largest contributor to ESA's planned contribution to the space station, the FRG played a role in European negotiations with the U.S. As the space station will take about 10 years to build and has an expected lifetime of 30 years, cooperation will continue over several decades and set the stage for additional collaborative space projects. NASA also has scheduled the shuttle launch of the second German space lab mission for late 1991. The first mission, launched in 1985 and manned with U.S. and German astronauts, was a major success.

This German-American partnership extends also to international environmental policy. The FRG became one of the leading proponents of international action to reduce the amount of ozone-depleting chemicals being released into the atmosphere. German scientists are involved in studying atmospheric ozone and also climate notification. Other areas of close scientific cooperation include the causes of forest damage and the effect of acid rain.

The FRG and the U.S. also agree on the need to take effective measures to curb the proliferation of nuclear explosives and ballistic missile technology. Both countries are members of the seven-nation missile technology control regime founded in 1987. A strong supporter of the International Atomic Energy Agency (IAEA), the FRG played a lead role in the international agreements adopted in 1987 on nuclear accidents. Bilaterally, the U.S. and the FRG cooperate in nuclear safety and waste management. Germany participates in the quadripartite fusion project in the IAEA.

In high energy physics, the German synchrotron (DESY) at Hamburg is rapidly becoming one of the world's premier centers. Among foreign researchers at DESY, Americans are the most numerous. The largest contributor to the CERN, the FRG has expressed an interest in scientific collaboration with the superconducting supercollider if the U.S. builds a facility.

One area of concern among German scientists and officials is the growing tendency in the U.S. to exclude foreigners from access to unclassified scientific information on grounds of national security.

American scientists and engineers usually enjoy full access to basic research in the FRG, and also the strong support of the government for cooperative activities. The German government frequently bears the financial responsibility for academic exchanges in both directions, and it often is easier for U.S. experts to gain access to German facilities than it is for German scientists to access American scientific facilities.

HUNGARY

The improved bilateral relationship between the U.S. and Hungary over the past decade augers well for cooperative S&T programs and activities. Many of the cooperative S&T activities with Hungary occur under a bilateral exchange agreement on culture, education and science and technology which was renegotiated in November 1987.

During FY 1988, science exchange visas were issued to more than 300 Hungarian scientists and physicians, and approximately 500 others visited the U.S. at the invitation of American professional associations and universities. These exchanges have accompanied official Hungarian acknowledgment of the importance of U.S. scientific and technological contributions to Hungary's economy and society.

Successful S&T exchanges are continuing in the areas of agriculture, geology, environmental protection, and health. Five Hungarian research institutions and companies are pursuing commercial ventures with American counterparts and eight other projects are under review. In the wake of the Chernobyl nuclear accident, Hungary also has turned to U.S. firms in seeking assistance in safer design and engineering of add-on nuclear reactors at its existing power plants in Pecs. S&T cooperation continues to make a modest, but very positive, contribution to achieving U.S. foreign policy objectives in Hungary.

There appear to be no major outstanding problems between the U.S. and Hungary on the protection of intellectual property rights or access to Hungarian research and facilities. Instances of unauthorized copying of computer software or the use of company logos have arisen in the past, but these generally have been settled amicably. The Hungarian government appears anxious to work out any problems due to the protection of intellectual property in reference to cooperation in science and technology.

INDIA

The U.S. science and technology relationship with India is one of the largest and broadest in the world. Cooperative work is carried out under the auspices of the Science and Technology Subcommittee, the Reagan-Gandhi science and technology initiative (STI), the Agriculture Subcommittee, and the USAID. The overall science and technology effort is supervised on the U.S. side in New Delhi by the Embassy's science council, chaired by the Ambassador.

Science and technology continued to play a prominent role in Indo-U.S. relations during FY 1988. The range and number of activities under the S&T Subcommittee continued to increase, the STI program was extended for three years in October 1988 and work began on the Vaccine Action Program of PHS and USAID. Moreover, progress was made on regulating technology transfer and monitoring S&T developments in India.

The highlight of FY 1988 was a meeting at Washington in October 1987 between President Reagan and Prime Minister Rajiv Gandhi. The two leaders, recognizing the great success of the Reagan-Gandhi science and technology initiative, called for extension of the program for another three years. During his visit, Prime Minister Gandhi stressed the importance of S&T cooperation, stating at a White House luncheon that science and technology was at the heart of Indo-U.S. relations. A White House team came to India in July 1988 to work out details of the STI extension agreement.

A review of the STI program by a panel of Indian senior scientists and eminent members of the U.S. National Academy of Sciences, led by Dr. William Gordon, took place at New Delhi in December 1987. The joint panel concluded that there had been excellent progress under STI, particularly in the areas of agriculture, solid state science and engineering, health, and short-term predictability of the monsoon. They noted that the new approach for joint collaboration had proved very successful in speeding approval of projects and increasing the exchange of scientists.

The improved climate for bilateral interaction under the STI program also has facilitated scientific data exchange between the two countries as exemplified by India making INSAT meteorological data available to the U.S. Moreover, the advanced level of cooperation in meteorological research under STI led to Indian purchase of a supercomputer to be installed in the newly formed Center for Intermediate Range Monsoon Forecasting.

The Ninth Indo-U.S. S&T Subcommission meeting was held at New Delhi in November 1987. The delegation included representatives of over a dozen U.S. technical agencies. The past year has seen unprecedented progress in implementing the recommendations of the working groups on materials and physical sciences and marine and atmospheric sciences. Similarly, environment and ecology and disabled persons research programs reached significantly higher levels of activity.

Two major defense research agencies, the Office of Naval Research (ONR) and the Office of Army Research, carry out programs in India. The ONR held four very successful workshops in India during FY 1988 in the areas of signal processing, materials processing and characterization, and solidification principles. Over 150 U.S. and 400 Indian scientists participated. Numerous projects for collaboration were developed and have received GOI technical approval from the government of India. These activities have acted as a catalyst for increasing defense cooperation between the two countries. Of particular interest during FY 1988 were the ONR-supported programs in bioactive substances and biodeterioration. The Office of Army Research continued its significant work in anti-malaria drugs.

During FY 1988, the Materials Science Program became an important and expanding area in Indo-U.S. collaboration. The 11 projects under materials science jointly funded by ONR and NBS have yielded excellent results and generated much interest on both sides.

NSF supported participation of 300 U.S. and 30 Indian scientists in 20 workshops and conferences held in India and the U.S. during FY 1988. NSF also supported the international travel of 90 U.S. and Indian scientists for collaborative research in a variety of fields.

The health program continued to play a very prominent role in the Indo-U.S. collaborative S&T program. The first meeting of the Joint Working Group (JWG) for the Vaccine Action Program (VAP) took place in New Delhi March 2-3, 1988. The Joint Working Group agreed on procedures under which the VAP will operate and identified priority areas for initial program activity. These include: hepatitis rotavirus, cholera, shigella, e. coli, typhoid, acute respiratory infections, canine rabies and polio. The JWG agreed to hold a second meeting in Washington D.C. on October 6-7, 1988.

Secretary S.S. Varma from the Ministry of Welfare led a delegation of six Indians to the U.S. to develop a policy for drug abuse control and prevention patterned on the U.S. model. The Indian Health and Human Resources Development, Minister P.V. Narasimha Rao, met with DHHS Secretary Otis Bowen in Washington D.C. in February 1988. The two leaders agreed to increase cooperation in health and family planning and share information on AIDS. The U.S. PHS agreed to support further training in HIV virology of two Indian scientists in the U.S. Other cooperative health projects included a project on rehabilitation of the hearing impaired which began in the spring of 1988, and a three-day bilateral symposium on generic drugs, bioequivalence and pharmacokinetics. This meeting was attended by over 250 scientists and representatives of Indian and U.S. drug companies. In November 1987, a day-long symposium in celebration of the centennial year of the U.S. National Institutes of Health was held at the all India Institute of Medical Sciences in New Delhi. Five prominent American scientists, including two Nobel laureates, and some of the leading figures on the Indian health and science scene took part in the symposium. It was attended by over 750 people and an association of Indian alumni of NIH was formed after the symposium.

With funding from the U.S.-India funds program, the National Institute on Disability and Rehabilitation Research (NIDRR) is collaborating with the Ministry of Welfare on a project to provide a comprehensive range of rehabilitation services for the disabled in rural India. One-thousand Indian rehabilitation professionals are providing training in rural areas backed up by services at the district level. Three additional projects related to spinal cord injury, and rehabilitation technologies, and information and documentation were established during FY 1988. This program has made a unique contribution in India, which previously had no rural rehabilitation services.

The past year has witnessed a significant increase in the number and diversity of Indo-U.S. cooperative activities in environment and ecology. Under an agreement between the U.S. National Park Service (NPS) and the Ministry of Tourism, two demonstration projects on the development of the Taj Mahal National Historical Park and of archeological sites related to the life of Buddha have been accepted. The Fish and Wildlife Service (FWS) has agreed to assist the Indian government over the next five years in the development of the Wildlife Institute of India, where all wildlife research and management personnel will receive formal training. FWS also supports four major projects in India on wildlife management, including endangered species. In addition, a major cooperative FWS project is producing educational television programs. The Smithsonian Institution supported a variety of research projects in ecology, including long standing ornithological studies and crocodile breeding and behavior. The Department of the Interior's Office of Surface Mining has two projects on reclamation of abandoned mines and collaboration in this area is increasing steadily.

USAID projects have developed according to traditional sectoral needs and the incorporation of science and technology into projects has followed these needs. Examples can be cited from each sector: The agricultural topics of mutual interest have been identified by the Indo-U.S. Subcommission. The vaccine and immunodiagnostics project, a part of VAP, supports collaborative research to develop diagnostics and new or improved vaccines for important diseases in India. Under the Program for Advancement of Commercial Technology (PACT), joint Indo-U.S. commercialization of technology is supported. PACT, and a similar project directed to the energy sector, the Program for Acceleration of Commercial Energy Research (PACER), help underwrite the costs of forming joint ventures, with attendant benefits for U.S. trade and investment.

A major focus of the USAID's new country development strategy statement is the expanded importance of science and technology. USAID will aim to develop a balanced S&T program, which is driven by and responsive to development needs and which views the entire science and technology process from laboratory to end use. Technology transfer is an integral element of this approach. USAID proposes to develop this program by continuing and expanding its sectoral activities as well as establishing activities that will address some cross-cutting areas and issues. In the Indo-U.S. science and technology relationship, the USAID programs serve the important U.S. foreign policy interest of helping maintain linkages throughout the Indian S&T community, especially in those areas that are essential to development and usually beneficial to both countries.

In general, India grants U.S. entities equitable and reciprocal access to scientific and technological opportunities, facilities and information. India has begun, in the past few years, to open even defense laboratories to U.S. visitors, although the Indian government restricts access to certain information on the basis of national security including meteorologic, oceanographic and geophysical data. In addition, technical problems involving data collection and reproduction, as well as professional distrust, continue to impede the free flow of information into the international scientific community.

Lack of adequate and effective protection of intellectual property rights in India threatens to jeopardize expanded collaboration. Negotiations called for in the recently renewed STI agreement are underway to ensure that intellectual property resulting from U.S. Government-sponsored and supported research and development is adequately protected in India, and that there is bilateral on the equitable disposition of intellectual property rights generated from collaboration.

INDONESIA

Indonesian-U.S. peaceful nuclear cooperation is highlighted by the successful nuclear Joint Steering Committee (JSC) arrangement which was created for the purpose of enhancing cooperation in several key nuclear fields, including radioisotope production and application, instrumentation, nuclear safety, and nuclear training. The JSC held its third meeting at Washington on April 18, 1988, and is expected to hold its fourth meeting at Jakarta in March or April 1989. Joint activities, particularly in the field of nuclear safety, are progressing. Nuclear safety and regulatory issues are paramount concerns for the government of Indonesia, and the Indonesian National Atomic Energy Agency (BATAN) is interested in continuing to strengthen ties with the U.S. in both these fields. Indonesian officials desire to diversify the energy

base in response to growing demand, and therefore nuclear power is viewed as a serious option. The Embassy continues to provide ongoing support for the participation of an American company in an Indonesian nuclear power program.

Geoscience cooperation is a significant element in the bilateral S&T relations between the United States and Indonesia. The Indonesian Directorate General of Geology and Mineral Resources (DGGMR) are successfully implementing a program designed to enhance Indonesian geoscience capabilities. Several major volcanic eruptions in Indonesia during the past year prompted the evacuation of more than 17,000 persons. The USGS advisory volcanologist met with members of the U.S. Embassy at Jakarta, and in June 1988 the Embassy donated \$25,000 to assist relief efforts. The USGS advisory volcanologist also has worked with the Volcanological Survey of Indonesia (VSI) to foster prompt responses to these eruptions, and to carry out eruption-related field studies and hazard assessment. These activities included providing briefings to officials at the ministerial and gubernatorial levels in the field and in Jakarta, as well as working with and advising the local relief committees in the field which directly handled disaster relief and evacuation measures. The USGS continues to cooperate closely with the DGGMR and the Indonesian coal directorate in peat and coal research projects. The ongoing coal and peat projects offer considerable scope for continuing USGS cooperative efforts in Indonesia with the DGGMR and coal directorate. The Embassy continues to work with the DGGMR and other Indonesian government agencies in an effort to conclude a memorandum of understanding between USGS and the DGGMR which would provide the framework for a broad range of cooperative activities.

Another area of U.S.-Indonesia cooperation includes medical research and health sciences with projects in entomology, virology, medical bacteriology, immunology and parasitology. U.S. technical agencies carry out projects in oceanographic research, mapping, aviation, wildlife preservation, environmental protection, assessment of mineral resources, agriculture and land reclamation. USAID also conducts an active program with Indonesia. In addition, the U.S. private sector has been very active in a wide range of science and technology developments in aerospace and avionics, telecommunications, energy and natural resources development, computers, electronics, and other fields. The companies have established close relations with the Indonesian private sector and have successfully retained or expanded market shares in several key areas. The companies have also provided technology transfer and training for significant numbers of Indonesian technicians and specialists.

The U.S. Embassy played a strategic role in achieving U.S. concurrence for the scalar upgrade to the IBM 3090 Model 400E vector processor system/supercomputer which is located at the Indonesian aircraft industry (IPTN) in Bandung. This plug-in supercomputer is being used for research, development and production work in engineering and manufacturing as well as administrative support functions.

The effective protection of intellectual property rights will be important to Indonesia as it seeks to encourage foreign investment in key sectors where higher technology is employed, such as computer software design and biotechnology in agriculture. On September 9, 1987, the parliament passed Indonesia's new copyright law. A patent law currently is under development. Effective enforcement of both laws will be important to Indonesia's economic development and, if successfully carried out over the next decade, will undoubtedly

increase Indonesia's attractiveness to foreign and U.S. investors in high technology industries. For Indonesia, adequate patent protection should encourage wider dissemination of technology, particularly in pharmaceuticals and agriculture; promote research and development; increase the skilled labor force and employment opportunities; and, most importantly, provide a viable basis for further technology transfer from abroad, which is of great interest to Indonesia. On copyrights, for example, adequate protection of computer software could help Indonesia become a regional center for computer software design in the coming decade. Several foreign businessmen, including some from the U.S. have indicated Indonesia possesses many of the characteristics and attributes that are required to excel in the area of software development. Should Indonesia become such a regional software center, the spinoff effects for the domestic economy could be significant, as would the opportunities for U.S. firms in the computer services industry. The umbrella S&T Agreement expires in October 1989.

In the short term, Indonesia's current economic difficulties, due in great part to declining oil revenues, and the resultant budgetary cuts have placed restraints on the country's S&T programs, including bilateral S&T cooperation with the U.S. However, over the longer term, science and technology are likely to play an increasingly important role in Indonesian economic development. As Indonesia looks to science and technology to provide solutions for many national development problems, prospects are enhanced for mutually beneficial S&T cooperation with the U.S.

ISRAEL

In FY 1988 three new formal agreements were signed: (1) between the DOE and Israel's Ministry of Science and Development for Cooperation in basic energy sciences, (2) between USDA and the Ministry of Agriculture in the area of soil conservation, and (3) between NIST and the Israeli National Physical Laboratory on recognizing the equivalence of time standards for international calibrations. Israel also signed the Montreal Protocol of the Stratospheric Ozone Convention.

NASA decided to make a major commitment this year to upgrade its laser tracking facility which operates in Israel as a part of the NASA coastal geodynamics program. Also during FY 1988, cooperative limnological studies were initiated between the U.S. National Undersea Research Program and the Israeli Oceanographic Institute's Lake Kinneret Laboratory.

Israel invests 3.04 percent of its GNP (about \$710 million) in research and development, which is high in percentage terms among industrial nations, but low in terms of actual dollars invested. The industrial sector performs 61 percent of the nation's R&D, 29 percent is performed in universities, and nine percent in federal laboratories. Israel depends heavily on cooperative science agreements with the U.S. to support its basic research activities.

This year, the Binational Science Foundation (BSF) awarded 135 new grants with a first-year total budget of \$4.2 million. This brings to 546 the total number of active joint BSF research projects. Life sciences, physics, chemistry and mathematics are the most active areas of cooperation. Special grant awards were given during 1988 for nine joint projects in superconductivity. BSF also sponsored joint workshops in the fields of chemistry, artificial intelligence and mathematics to plan the next series of joint projects.

Israeli Agriculture is one of the most highly planned sectors of the economy, in consideration of its export potential and heavy demand for water. Today, Israel produces 95 percent of its food requirements and exports of fresh and processed agriculture exceeded \$1 billion during FY 1988. Israeli researchers focus particular attention on improving irrigation techniques, agrotechnical systems, plant-protection practices, agrochemistry and veterinary activities.

The U.S.-Israeli Binational Agricultural Research and Development Foundation (BARD) currently has 185 active joint projects. During FY 1988, 36 proposals were recommended to the Board of Governors for approval, with a total budget of about \$7 million. The USDA Soil Conservation Service sent experts for consultation with counterparts in the Ministry of Agriculture, resulting in a signed formal cooperative agreement.

Israel imports nearly 98 percent of its energy needs. A major effort has been made to lessen this dependence on imports by diversifying energy sources and emphasizing energy conservation. Today, about 60 percent of electricity is supplied by coal, but efforts are underway to utilize indigenous low-grade oil shale. Israel is a world leader in the use of solar energy. The DOE-Ministry of Energy and Infrastructure agreement held its joint committee meeting during FY 1988, and agreed to conduct further research in fossil fuels and renewable energy resources. The DOE-Ministry of Science and Development agreement signed in FY 1988 will be the vehicle for joint projects in basic energy sciences.

Over two-thirds of Israel's economic activities are concentrated along a narrow coastal zone, where meteorological conditions are unfavorable to disposal of pollutants. Over 50 percent of the Israeli government's environmental expenses are devoted to pollution prevention, and another 30 percent to nature protection. Water consumption has reached two billion cubic meters per year, and the supply is seriously threatened by overuse, pollution and saline infiltration. U.S.-Israeli joint efforts, through formal agreements and informal exchanges, are helping to address many of these problems. With U.S. support, Israel increased its awareness of stratospheric ozone concern and signed the Montreal Protocol. During the year, U.S. agencies also hosted representatives of the Israeli Environmental Protection Service, National Parks Authority, and Oceanographic Institute for site visits and discussions of environmental concerns. NOAA and the Bureau of Reclamation hosted a planning session with the Israel Oceanographic Institute director to organize joint research in Lake Kinneret and the Mediterranean coastal region.

Finally, the U.S. is a major contributor to Israel's regional stability, and technical assistance is provided, in part, through two USAID-sponsored cooperative agreements. The aid cooperative development research program has 80 active projects with a total budget of more than \$11 million. This allows cooperation between Israeli researchers and their counterparts in roughly 25 developing countries. Agriculture and health services are emphasized. The USAID Middle East regional cooperation initiative remains active between the U.S., Israel and Egypt, with projects in agriculture, arid lands studies, marine science and tropical diseases.

ITALY

The long-standing formal science and technology relationship between Italy and the U. S. was renewed in 1988 with the signing in April by Secretary Shultz and Foreign

Minister Andreotti of a new agreement covering science and technology cooperation. An important part of the new agreement is provision for the protection of intellectual property rights, reflecting the strong connections between scientific research, technological development and economic development.

The accord, in force until 1993, will be managed by the Department of State and the Ministry of Foreign Affairs, reflecting the growing importance of foreign policy implications in science and technology cooperation.

Under the overall agreement, over 20 interagency arrangements govern cooperation in diverse areas, including high energy physics, space, energy, environmental protection, health, nuclear safety and agricultural research. In addition, the Italian National Research Council (CNR) is negotiating a new memorandum of understanding (MOU) with NSF governing research in the basic sciences.

In space, Italy continues to be the strongest supporter in Europe of direct bilateral cooperation with the U.S. About half of the present \$800 million space budget is tied to U.S. programs. On March 25, Italy and the U.S. together launched a scientific satellite, the San Marco, from the Italian range near Malindi, Kenya. The creation this year of the Italian Space Agency (ASI) presents new opportunities for expanding U.S.-Italy space relationship.

The Italian Ministry of Environment and the EPA are implementing their 1987 MOU in three areas: disposal of wastes, automotive air pollution and data exchanges. U.S. representatives are discussing Italian participation in the superconducting supercollider, scientific exchanges in the Antarctic and research on databases.

The Italian decision to defer nuclear energy use after last year's referendum has enhanced prospects for cooperation in nuclear safety and radioactive waste storage and disposal. Both sides also will benefit from joint research between DOE and the Italian Ministry of Industry aimed at reducing dependence upon imported petroleum and for long-term energy security. Of particular importance is the joint fossil fuel program, which provides for increasing efficiency and reducing the environmental impact of burning coal.

The U.S.-Italian scientific relationship is affected by a number of international trends. The drift toward European integration, characterized, *inter alia*, by large joint European science projects (e.g. Eureka, Brite, Esprit, Race), increasingly requires Italian policy makers to choose between U.S. and European programs in allocating scarce funds and talent. Emphasis in the U.S. and in Europe on economic competitiveness has caused both sides to be more cautious in implementing research and development collaboration.

The Italian government recently passed a law to attract back to Italy those scientists that emigrated in the past, especially to the U.S. The government believes the knowledge and expertise of these scientists would greatly augment Italy's scientific efforts. The law provides that government research agencies, such as the National Research Council and the National Institute of Nuclear Physics, can hire Italian scientists from abroad at salaries competitive with those internationally.

The reciprocity of access between the U.S. and Italy to scientific and technological organizations constitutes an old and well consolidated pattern. Even the first

intergovernmental S&T cooperation agreement signed in 1967 regulated the exchange of information and visitors to that of mutual benefit. In recent years, the exchange of visiting scientists has equaled out and is often spurred on by personal acquaintances made when Italian scientists visited the U.S. under earlier cooperative projects. The most recently signed renewal of the intergovernmental agreement includes language concerning the protection of intellectual property rights.

JAPAN

Science and technology cooperation has been and continues to be a strong element in U.S. relations with Japan. The original objective, to integrate Japan into the community of advanced western industrial democracies, has been achieved with resounding success. Japan's access to western science and technology has made a major contribution to the country's development as a stable and prosperous democracy, closely allied with the U.S. and the West. Japan has emerged as one of the world leaders in science and technology and serves as an element of security and stability for the East Asian and Pacific region as a whole.

One result of Japan's emergence as a technological leader has been the recognition by both the U.S. and Japan of the need to refocus bilateral S&T cooperation on goals more appropriate to the two countries' resources and priorities today. This process was initiated in February 1987, when the President's Science Adviser, William R. Graham, traveled to Tokyo to launch a dialogue with the Japanese concerning renewal of the basic agreement covering S&T cooperation in non-energy areas. Negotiations to develop a new S&T agreement were initiated in the fall of 1987 and were brought to a successful conclusion early in 1988. The product of these negotiations, a new U.S.-Japan agreement on cooperation in research and development in science and technology, was signed by President Reagan and Japanese Prime Minister Takeshita in June 1988. This agreement will serve as the basis for a firm partnership assuring equity of access and scientific benefit, and protection of intellectual property rights, in all cooperative activities in science and technology, in spite of differing national R&D policies and structures. Areas targeted in the agreement for future scientific cooperation are life sciences, biotechnology, advanced materials, including superconductivity, information sciences, manufacturing technology, automation and process control, global geosciences and environment and joint data base development. Concurrent with these negotiations, the Japanese government undertook a number of new initiatives intended to make its ongoing research and development programs more open to the world scientific community.

An especially important development has been the establishment by various Japanese government agencies and laboratories of major new scientific fellowship programs that will allow young foreign researchers to participate in research sponsored by the government of Japan. One such program, announced by Prime Minister Takeshita at Washington in January 1988, has provided \$4.8 million to the U.S. government for U.S. scientists seeking to carry out research in Japanese laboratories. This program, together with others now funded by the Ministry of Education, the Science and Technology Agency and the Ministry of International Trade and Industry provides opportunities for 150 to 200 American researchers to work in Japanese laboratories for periods up to one year. The majority of these researchers will be selected by various agencies of the U.S. government. In a related development, a memorandum of understanding (MOU) between the Agency of Industrial Science and Technology of the Ministry of Trade and Industry and NSF

signed in 1988, includes a provision for an additional 30 U.S. scientists to conduct research (at U.S. expense) at Miti Laboratories.

Other especially significant S&T developments which took place during 1988 include:

- The entry into force in July of a new U.S.-Japan agreement on peaceful uses of nuclear energy. Signed at Tokyo in November 1987 by Ambassador Mansfield and then Foreign Minister Kurinari after some five years of detailed bilateral negotiations, this agreement reflects changing realities in the field of nuclear energy. It provides the basis for a long-term, stable relationship between the two countries in the further development of this important energy technology.

- Completion of the negotiation of agreements covering the participation of Japan and other foreign partners in the multilateral space station project. The largest international S&T project ever undertaken, the space station will serve as the basis for ensuring that mutually beneficial U.S.-Japan space cooperation activities will continue for many years into the future. Initially, the Japanese plan to develop an experimental module, and to contribute to the infrastructure of the space station.

REPUBLIC OF KOREA

Cooperation in science and technology between the U.S. and Korea reflects the continuing friendship and close ties with this important ally. Based on mutual benefit, the activities spread across the scientific spectrum.

A government-to-government umbrella agreement provides the policy framework for this cooperation. The existing agreement was originally developed in the mid-1970s when Korea had very little technological capacity. In view of the rapid development of Korea and, importantly, looking ahead to expected progress over the next 10 years, the U.S. initiated negotiations to amend that agreement so that it would properly represent the technological level of the anticipated cooperation and include provisions for the adequate protection of distribution of IPR. Policy aspects of the ever-growing industrial linkages, invention rights from shared research, and defense industrial cooperation are to be included in the new agreement. Significant outstanding issues remain, and on October 31, 1988, the U.S. let the agreement lapse, reflecting a lack of progress in negotiation on IPR. According to Article II of the agreement, its termination does not affect the validity of the arrangements under it, so the effect of a short period of expiration would be minimal, though the long-term effect would be significant.

During FY 1988, Korea has made progress in establishing an export control system to protect advanced strategic technology, with full establishment of an internationally acceptable system still pending. Technology export control is needed to assure mutual security, and also to maintain Korea's continued access to advanced technology from the U.S. and other industrialized countries. Korea's national assembly must review the government-to-government agreement that was concluded in September 1987. The development of a new constitution and the very important government changes in Korea this past year have slowed assembly review of the agreement.

Nuclear cooperation between the two countries assists in enhancing public safety and in advancing the development of nuclear technology. With over 50 percent of its electrical power coming from nuclear plants, Korea has made a major commitment to nuclear power. The majority of their nuclear infrastructure is of U.S. origin.

Excellent cooperation between the Nuclear Regulatory Commission (NRC) and its Korean counterpart has enhanced Korea's capabilities in regulation, inspection, emergency response, nuclear safety and joint research, and has entailed extensive exchange of information mutually beneficial to both countries. Exchange programs with DOE have provided training in spent fuel management, fuel fabrication technology and other areas supporting broad U.S. nuclear policy objectives. Regular bilateral discussions on peaceful applications of nuclear energy offer a forum for consideration of nuclear policy matters, including issues arising in the International Atomic Energy Agency (IAEA).

Cooperation in environmental matters was enhanced with the signing of a memorandum for cooperation between the EPA and its Korean counterpart. In addition to joint studies of mutual benefit, the formal cooperative mechanism will facilitate discussions of broad environmental issues, including proper environmental standards to be applied to U.S. industrial investments in Korea. Very importantly, the environmental cooperation presents a vehicle for soliciting Korean support of U.S. positions on such crucial issues as the problem of stratospheric ozone.

In general, neither the public nor private sector have denied access to research facilities to individual U.S. scientists. A significant percentage of Korean research institutes have invited and received U.S. delegations from American research institutes and organizations. Typically, close contact is maintained between U.S. and Korean counterparts through personal friendships, and the applied nature of Korean research and development has led to cooperative projects with U.S. companies. The proper protection of intellectual property is a major area of concern and negotiations between the two countries.

MALAYSIA

Malaysia is placing increased emphasis on the enhancement of its scientific and technological capabilities. Research and development supports growth in traditional primary products and in value-added activities downstream from primary products. Technology transfer is indispensable to improving Malaysia's ability to manufacture for export and for the supply of inputs to foreign companies with manufacturing operations in Malaysia. Malaysia sees the U.S. as predominant or among the leaders in most technologies and gives the U.S. high marks for its willingness to share them. Nonetheless, the absence of a USAID program in Malaysia and Malaysia's budgetary constraints have limited U.S.-Malaysia cooperation to modest growth.

The highlight for FY 1988 was the visit of the Malaysian Minister of Science, Technology and the Environment to the U.S. at Science Adviser Graham's invitation. The Minister met with Washington officials and also visited laboratories and a toxic waste treatment facility. The NSF is sending one of four foreign participants to a workshop organized by the Malaysian scientific advisor to the Prime Minister. This workshop will develop procedures for monitoring and evaluating government-funded research and will have a great impact on

future government budgets for research and development. The Smithsonian Institute, NOAA, the Department of Interior's Bureau of Reclamation, the USDA Cochran Program, and USAID, through its regional programs with ASEAN, all continued limited cooperative activities in Malaysia. The Malaysian government funded all or part of many of these activities.

The major S&T issue confronting the U.S. in Malaysia is how to increase S&T cooperation. The U.S. brought two key Malaysian officials to the U.S. for a conference on substitutes and alternatives to chlorofluorocarbons. Their experience at the conference has been instrumental in stimulating Malaysia's review of the Montreal Protocol. There are many opportunities such as this to support specific initiatives and to counteract the impressions, which have arisen from time to time over trade issues, that the U.S. does not support economic growth in Malaysia. Science and technology is firmly linked with economic development in Malaysia, and the Malaysian press consistently gives strong coverage to S&T cooperation with developed countries.

At present, in the absence of a formal intergovernmental S&T agreement the U.S. and Malaysia do not have an equity of access question. However, there have been no apparent denials of access for either government or privately supported American scientists and engineers to Malaysian research facilities. U.S. firms that operate in and sell products in Malaysia that are of a technological nature requiring patent and copyright protection generally are satisfied with Malaysia's domestic legislation governing intellectual property protection.

MEXICO

Mexico is one of the leaders among Latin American countries in advanced scientific programs and technical capabilities, and the U.S. government has played a major part in this development. Mexico and the U.S. have as many as 19 interagency S&T agreements in force, including an intergovernmental cooperation agreement covering a wide range of scientific and technical fields. These include nuclear safety, environment, marine research and fisheries, biomedical research, basic sciences, regulatory questions, and joint research in the preservation of endangered species and ecosystems. Mexico's geographic proximity to the U.S. and mutual 2,000 mile border dictate a strong interest in research on subjects of mutual benefit to both countries.

On June 6-7, 1988, the sixth meeting of the U.S.-Mexico Mixed Commission on Scientific and Technological Cooperation took place; the Commission was established in 1972 by Executive Agreement. At this first meeting of the commission since 1983, the U.S. and Mexican delegations worked to give new vigor to the 1972 Agreement on Cooperation in Science and Technology. The mixed commission designated the Department of State and the Secretariat of Foreign Relations (SRE) as the executive agencies of the cooperative S&T program. The U.S. stressed the cross-cutting issues of protection of intellectual property rights, scientific access, financing of travel, and scientific communication. The six sectoral groups (*i.e.*, agriculture, energy and mining, urban development and ecology, health, marine fisheries research and atmospheric sciences, and basic sciences) discussed ongoing projects and, with a keen awareness of budgetary restrictions, new areas for cooperation.

At San Diego, on June 14-17, 1988, U.S. and Mexican government representatives held the fourth meeting of the national coordinators to pursue implementation of the 1983

border environment agreement. The four annexes to the agreement are all functioning very well. During the meeting, the U.S. side tabled draft Annex V on urban air pollution in border cities.

The working groups on air pollution, water pollution, hazardous wastes, and joint response planning each met and reviewed the progress since the May 1987 meeting. Both national coordinators expressed their pleasure with the progress made during the past year. The Department of State and the Mexican Secretary of Foreign Relations view the accomplishments in environmental cooperation as a highlight of the bilateral relationship.

Throughout the year, the U.S. has continued to work with the International Boundary and Water Commission (IBWC) on the solution to border pollution problems at Laredo, Nogales, New River and other locations. The U.S. is pursuing a long-term, binational solution to the San Diego-Tijuana sanitation problem with the government of Mexico, city and county of San Diego and the state of California.

The U.S. Fish and Wildlife Service has seven cooperative projects in Mexico, including assisting in preserving migratory bird habitats and sites for endangered marine turtles. The Mexican government announced the formation of several turtle egg laying preserves. Mexico is in the process of joining the International Convention for Endangered Species (CITES) in order to stem the flow of illegal trade in endangered species. A North American waterfowl management plan memorandum of understanding was signed by Mexico commemorating a tri-party agreement between the U.S., Canada, and Mexico to jointly manage North American waterfowl.

Cooperative agreements and discussions between U.S. and Mexican officials to promote fisheries research and trade have resulted in several more U.S.-Mexico joint venture start-ups. On June 24, 1988, a new information exchange agreement was signed by American and Mexican officials, in addition to the other two marine research agreements currently under operation (i.e., Mexico-U.S. Gulf and Mexico-U.S. Pacific). Technical assistance and cooperation projects with the private sector have been developed through the regional office of USAID. Specific projects relate to sardine stock assessment in the Pacific coast region and blue crab industry and aquaculture development in the Gulf of Mexico. Promotion of U.S. seafood exports and U.S.-Mexico fisheries joint ventures also have been encouraged.

NOAA cooperates with Mexico by donating observation equipment (atmospheric and oceanic), providing expertise in modernization and government weather services, and processing of satellite data from Mexican weather stations. NOAA also conducts hurricane observation flights in Mexican air space with participating Mexican meteorologists and technicians who receive training in this highly specialized field.

The Laguna Verde nuclear power plant is technically complete and awaiting a political decision for fuel loading and startup. This is Mexico's first nuclear power plant.

Noteworthy achievements reached in 1988 include the following:

- Joint plan for accidental releases of hazardous substances along the border (EPA/SEDUE), January 1988;
- MOU between the Mexican Secretariat of Health and U.S. FDA regarding cooperation in the scientific and regulatory fields of health (FDA/SSA), February 1988;

- Establishment of the joint border sister-city committees of urban development (HUD/SEDUE), March 1988; and
- Understandings between the U.S. and Mexico government on cooperation in case of natural disasters (FEMA/Gobernacion), March 1988.
- IBWC Minute Number 276; Agreement on Mexican participation in expansion of the Nogales International Waste Water Treatment Plant, originally constructed in 1950 and enlarged and relocated in 1972, and now being further enlarged and improved to meet the needs of Nogales, Arizona and Nogales, Sonora until the year 2000, July 1988.

Science and technology is an important area of agreement in the U.S.-Mexico relationship. A great majority of valuable S&T activity takes place between the two countries through the private sector and not under the formal umbrella of agency-to-agency agreements. There are numerous contacts between university researchers and the Mexican scientific academies leading to strong links between the two scientific communities, and resulting in significant scientific and economic benefits for both countries.

PAKISTAN

United States agencies have conducted cooperative S&T projects in Pakistan for a number of years using special foreign currency funds. These funds have not been available after FY 1987, although some work has continued with carryover funds appropriated in previous years. The Public Health Service has a number of ongoing and planned projects, many of which were awaiting final approval last year from the government of Pakistan. They have now received approval and will be getting underway. These projects include studies which should contribute to the world fund of knowledge on senile cataract formation and cardiovascular disease. Several oceanographic projects funded by the Office of Naval Research are awaiting final approval. NSF has maintained a well-received program with Pakistan for several years in the basic and applied sciences. Under a participating agency service agreement with USAID, the USGS is cooperating with the geological survey of Pakistan in a coal resources assessment program for the development of thermal electric power.

In October 1988, the President's Science Adviser, Dr. William Graham, met with key Pakistani government officials and scientists regarding a wide variety of science and technology issues. Several areas for mutual S&T cooperation were identified.

POLAND

Following several years of inactivity, important steps have been taken to renew U.S.-Poland cooperation in scientific and technological areas. The major accomplishment of FY 88 involved laying the administrative and financial groundwork for implementation of the bilateral umbrella S&T agreement signed by the Vice President and his Polish counterpart in September 1987. This entailed agreement on utilization of funds remaining in the previous cooperative S&T program, formulation of guidelines for project proposals and exploratory travel, and establishment of a Joint Commission to manage the new program.

The inaugural session of the newly constituted Joint Commission took place at Washington in June 1988, and represented the formal resumption of science and technology

cooperation after a hiatus of more than six years. The Joint Commission authorized agency-to-agency discussions aimed at developing joint research projects for approval dependent upon the levels and availability of the U.S. contribution to the S&T Joint Fund in FY 1989 (to be matched in zlotys by the Polish government).

Areas of principal mutual interest include biomedical research, agriculture, environmental protection and the basic sciences. During the current fiscal year, subsidiary S&T agreements were concluded in the basic sciences involving NSF and the Polish Academy of Sciences and geoscience between the U.S. Geological Survey and the Polish State Geological Institute. With the withdrawal of the zloty from the Treasury Department's excess currency list at the end of FY 1988, nonconvertible Polish currency will no longer be available to support S&T cooperation with Poland.

With an agreement in hand on the criteria for project formulation and evaluation, the cooperative S&T program promises excellent return per dollar invested in terms of both substantive product and foreign policy efficacy. Polish scientific talent continues to be grossly under used and under funded. A very modest infusion of dollars--several thousand per project year--can increase the productivity of Polish researchers several fold, and provide U.S. technical agencies with valuable research results at a fraction of the cost in the U.S. It also would restore a once vital link between productive professional circles in both societies.

SAUDI ARABIA

The U.S. and Saudi Arabia have a wide-ranging cooperative S&T program coordinated through the U.S. Embassy in Riyadh and the U.S.-Saudi Joint Economic Commission. Under this and other bilateral programs, a number of U.S. agencies provide training assistance to their Saudi counterparts on a reimbursable basis. For example, Saudi statisticians have attended seminars at the Bureau of Labor Statistics, and NIST is assisting in the upgrading of Saudi technical standards. The government of Saudi Arabia provided \$100 million in funding for cooperative S&T activities with the U.S. during FY 1988.

In cooperative S&T activities, NSF is working with the King Abdul Aziz City for Science and Technology (KACST) to strengthen its scientific research capabilities. NASA and KACST cooperate in remote sensing experiments, and NOAA is assisting in the construction of an earth station to receive satellite data. USGS has a wide range of activities in Saudi Arabia, and the Bureau of Reclamation is working on desalination. PHS is assisting in upgrading the Saudi health-delivery system. The Federal Aviation Administration (FAA) of DOT plays an important cooperative role in the certification of Saudi airline personnel and airports. The FAA also serves in an advisory capacity to the Saudi Presidency for Civil Aviation (PCA).

SOVIET UNION

During the past year, bilateral scientific and technology cooperation with the Soviet Union has been a constant feature of the U.S. agenda. Two summit meetings in less than one year resulted in agreement on the desirability of continuing to expand mutually beneficial cooperative exchanges. Since the Geneva Summit in November 1985, where both countries first called for broader cooperation in areas where both stand to

gain, contacts have more than doubled between American and Soviet scientists and engineers.

At the Washington Summit in December 1987, President Reagan and General Secretary Gorbachev agreed to intensify cooperative efforts in the fields of transportation, science and technology, global climate and environmental change, and world ocean studies. They also agreed to promote further cooperative efforts to develop thermonuclear fusion for peaceful purposes and to initiate cooperation in the field of nuclear reactor safety.

Since the Washington Summit and during the period leading up to the May 1988 Moscow Summit, these commitments were met. Among the highlights of this period was the new agreement in transportation science and technology, aimed principally at improving safety in national and international transportation systems. The agreement was negotiated in April and signed at the Moscow Summit.

In February, EPA Administrator, Lee Thomas, successfully negotiated under the terms of the bilateral agreement on environmental protection, a new program of cooperation in climate change and related research. In the related area of studying the World Ocean, both sides have agreed to propose new areas of cooperation for consideration prior to the December 1988 expiration of the bilateral agreement in this field.

Since the November 1985 Geneva Summit where the President and General Secretary emphasized the potential importance of thermonuclear fusion for peaceful purposes, both sides have agreed with Japan and the European Community on a four-party design study of a fusion test reactor under the auspices of the International Atomic Energy Agency (IAEA). The study was initiated in May 1988. Meanwhile, in the field of civilian nuclear reactor safety, in April the U.S. and Soviet Union signed a new memorandum of cooperation under the terms of the bilateral agreement on peaceful uses of atomic energy which formally establishes cooperation in this field. Collaboration in this area could prevent another nuclear power disaster such as the April 1986 accident at Chernobyl.

At the conclusion of the Moscow Summit in May, the President and General Secretary agreed to extend the bilateral agreement on peaceful uses of atomic energy, to accelerate efforts to conclude an agreement on basic scientific research, and to continue to expand activities in areas of mutual benefit under the remaining bilateral scientific agreements. Also at Moscow, both sides reemphasized the need to expand cooperation in the field of global climate and environmental change.

United States and Soviet delegations met at Washington in May before the Moscow Summit to negotiate a new agreement on basic scientific research--an agreement which already had been in the planning stages for over one year. A draft agreement was initialed ad referendum and it presently is under review within both governments.

The U.S. proposed at the Moscow Summit that the two countries expand existing cooperation under the 1987 bilateral agreement on exploration and use of outer space for peaceful purposes. As a result, the two sides agreed to exchange results of independent feasibility studies of future unmanned missions for solar system exploration, including missions to the moon and Mars. Both sides also agreed to exchange opportunities to fly instruments on each other's spacecraft, and to expand exchanges of scientists and of scientific data. Efforts to expand cooperative activity in other areas of mutual benefit continue.

SPAIN

An important policy goal of the U.S. in its relationship with Spain is to increase cultural and mutually beneficial scientific links between the two countries. Joint science and technology projects have strengthened links between the respective scientific communities and have significantly broadened these ties between the two countries. Both governments value the S&T relationship and wish to see it continue.

The character of future joint S&T cooperation will necessarily change with the termination of the 1983 Agreement on Friendship, Defense, and Cooperation. The S&T program has been an integral part of this agreement, which also provides for U.S. use of Spanish military facilities. The 1983 agreement provides for funding of cooperative research in areas relevant to the economic modernization and social well-being of the peoples of the U.S. and Spain. The agreement expired on May 13, 1988, but its provisions remain in effect for one additional year. Both governments are in the process of negotiating two successor agreements. One will be limited to defense cooperation, while the other will cover science and technology, as well as educational and cultural cooperation. The FY 1988 appropriation by Congress and subsequent allocation of economic support funds for science and technology for Spain in the amount of \$1.75 million is for terminating the current program. Both governments have agreed to terminate the current program by December 31, 1989. This will allow the projects currently underway to be completed without additional interruptions such as those caused by the FY 1987 reduction in funds. Ongoing projects, principally in the fields of health, agriculture and marine sciences, continue to make important contributions to scientific knowledge and to strengthening scientific links between the two countries.

THAILAND

Official U.S.-Thailand cooperation in science and technology is an important part of bilateral relations between the two countries. The largest element in this cooperation consists of the USAID-supported efforts of the Thai Science and Technology Development Board (STDB) which includes research, development and engineering grants for the support of research projects on topics in the fields of biologic sciences and biotechnology, materials sciences, and applied electronics. These grants often involve participation of U.S. scientists or engineers either as visitors to the research sites in Thailand or as hosts for Thai visitors to the U.S. for briefing and consultation on work which is in progress in the U.S. This collaborative effort gives added visibility to U.S. scientific research and to U.S. instrumentation.

Through a contract with the National Academy of Sciences, the STDB has direct access to a supply of needed technical consultants, and a series of consultant visits is in progress. The STDB already has a fellowship program for enhancing the availability of needed technical personnel. A series of industrial services currently is being organized. In addition to these bilateral science activities, approximately 60 research projects involving U.S.-Thailand collaboration supported by the USAID science office also are active, providing additional opportunities for scientific exchanges.

UNITED KINGDOM

Scientific relations between the U.S. and the U.K. remain extensive and close at all levels -- governmental, institutional and individual. Interactions between scientific societies of both countries, frequent exchanges between governmental institutions, and fruitful industrial relationships are continual. While a number of topical or project-related memoranda of understanding (MOUs) have been concluded between counterpart agencies of the two governments, there has been no perceived need for an umbrella science and technology agreement. During the past year, both nations have focused on competitiveness as a national objective, and both have engaged in efforts to increase their coordination among government institutions, universities and industry on technologies to which R&D expenditures should be devoted. In the U.K., the Advisory Committee on Science and Technology, (ACOST), chaired by the chairman of Rolls Royce, Sir Francis Tombs, has been established to advise the government on S&T priorities. To assist this committee, a Center for the Exploitation of Science and Technology (CEST) has been established at Manchester University.

Following the NSF example, the British government is in the process of establishing a series of interdisciplinary research centers, most of which will be housed at various universities. The goal is to establish some 40 such centers over the next few years.

Cooperation and coordination on nuclear energy and nonproliferation issues between the U.S. and U.K. continue to be extremely close. Annual bilateral consultations on these issues, which include sharing information on sensitive nuclear transactions, are reinforced by almost daily interactions by the respective embassies on a wide range of nuclear topics. The U.K. has embarked on a program to construct a number of pressurized water reactors based upon U.S. design. This will lead to strengthened ties between the nuclear industries of both countries.

In health matters, the U.K. continues to regard cooperation with the U.S. as essential in the international fight against AIDS. U.K. health officials welcome opportunities to coordinate research and public education with the U.S., and several joint projects are underway involving government and private funds. The U.K. decision in April 1988 to participate with the European space agency in the U.S. space station project will add an important scientific and foreign policy dimension to the relations between the two nations. This past year also witnessed the signing of the Montreal Protocol on ozone layer depletion by the U.K. and other actions related to the acid rain problem. These actions represent an increased congruence between the U.S. and the U.K. on environmental issues.

YUGOSLAVIA

The U.S.-Yugoslavia program of S&T collaboration began in the mid-1950s, financed by U.S.-owned excess currency. Beginning in 1973, this bilateral S&T program continued with matching funds from the two parties under the U.S.-Yugoslavia Joint Board on scientific and technological cooperation. The Joint Board operates under an umbrella S&T agreement signed in 1973, renewed and revised in 1980 and 1988. The U.S. contribution to the Joint Fund derives from a line item in the budget of the Department of State. As has been discussed extensively in previous issues of this report, this S&T program

under the Joint Board has maintained a strong influence on the Yugoslav S&T community as well as the concerned federal, republic and province S&T ministries and administrators.

In FY 1988, as in the past, projects may be funded partially in dollars and partially in Yugoslav dinars. The U.S. dollars are used by Yugoslav research institutions, with U.S. technical agency concurrence, to purchase needed equipment and for dollar per diem expenses for Yugoslav scientists involved in short-term and long term training with their co-investigators at U.S. facilities.

In a period of restricted availability of hard currency in Yugoslavia, this method of handling the funds has optimized the use of resources. In many instances, the local and federal government have provided increased dinar funding from Yugoslav sources. Most U.S.-provided funds have been, and will continue to be, spent in the U.S. largely as a result of the bilateral S&T relationship. The majority of Yugoslav purchases of scientific research equipment are from U.S. suppliers with dollar funds.

Collaborative projects between U.S. and Yugoslav scientists are evaluated in a peer review system by U.S. technical agencies after being screened by Yugoslav professionals. They are of mutual benefit to the two countries, and project results contribute to the worldwide body of scientific knowledge, to the specific research needs of the U.S. and Yugoslavia, and in numerous instances to Yugoslav economic development as well as being of economic benefit to the U.S.

Yugoslav scientific researchers are world leaders in several fields. Their development of sunflowers is an example, reflected in the fact that most sunflowers planted in the U.S. are Yugoslav-developed varieties. Yugoslav research on bio-electrical stimulation of muscles of limb-disabled individuals, especially paraplegics, is a pace setter. Yugoslav rehabilitation engineers, funded by the Joint Board and the U.S. National Institute of Disability Research and Rehabilitation, are investigating possible use of electrical and magnetic stimulation to cause growth of damaged nerves and the reconnection of nerve pathways. An imaginative Yugoslav proposal to use a sophisticated hybridization technique to map the human genome is being sponsored by the Department of Energy and the Joint Board. If the process proves successful, the cost and time to map the genome will be reduced substantially from that estimated by the National Academy of Sciences.

The U.S.-Yugoslavia program of bilateral S&T activities for mutual benefit, shared research results, and with shared costs is a model for other U.S. cooperative S&T programs. Many of the Yugoslav scientists involved in Joint Board projects receive some training in the U.S. facilities; these scientists frequently become leaders in the scientific community and in government. This is a major bilateral program with Yugoslavia and has strongly influenced science development and Yugoslav attitudes toward such development.

Most of the joint projects are carried out in Yugoslav laboratories under the direct supervision of Yugoslav principal investigators who give American scientists equitable and reciprocal access to the research activities and facilities. The new intergovernmental S&T agreement signed in June 1988 contains language concerning the protection of intellectual property rights. As a matter of official policy, Yugoslavia encourages access to scientific and technical information, and Yugoslav practices generally are consistent with this policy.

CHAPTER 4: UNITED STATES PARTICIPATION IN THE SCIENTIFIC AND TECHNOLOGICAL ACTIVITIES OF INTERNATIONAL ORGANIZATIONS

ORGANIZATION FOR ECONOMIC COOPERATION AND DEVELOPMENT (OECD)

Economic growth in the OECD member countries is strongly dependent upon technological change and the consequent generation of new products and processes. Government policies often can stimulate innovation and entrepreneurial activities, improve structural conditions, and generate market-led economic development. The Committee for Scientific and Technology Policy (CSTP) of the OECD engages in a variety of activities which reflect this fact. The CSTP continues to focus on technology and its impact on economic growth by identifying opportunities that can assist member countries in better utilizing technology for their industrial and economic needs.

The OECD offers a convenient multilateral forum for the U.S. to discuss broad policy issues with its major free world trading partners. The contribution of science and technology to economic growth was the focal point of a ministerial-level meeting of the CSTP in October 1987. At the ministerial-level meeting, the U.S. suggested that the OECD should give high priority to identifying factors that accelerate the rate of scientific discovery, advance international openness and cooperation in the basic sciences, and encourage the diffusion and commercial exploitation of new technologies. Following the ministerial meeting, the CSTP drafted guiding principles for international cooperation in science and technology based on the suggestions of the Science Ministers. These principles subsequently were adopted by the Council in April 1988. The General Framework of Principles for International Cooperation in Science and Technologies identifies the main areas for government action to promote cooperation and remove barriers to science and technology exchanges.

In adopting the framework, OECD countries considered it essential to restate strongly that scientific and technological progress and its contribution to economic growth and social development cannot take place without the widest possible circulation of ideas and information. To this end, the framework urges member countries to promote cooperation in research programs which are oriented towards industry, encourage the circulation and trade of technologies, encourage cooperation between enterprises, and improve the protection of intellectual property rights.

The U.S. also is actively involved in the work of the OECD Committee on Information, Computers and Communications Policy, Environment Committee, Chemicals Group, Nuclear Energy Agency, and the International Energy Agency's R&D Committee. As is the case in the CSTP, the work of these bodies focuses on cooperative activities to ensure more effective utilization of technology in the promotion of economic growth, energy security and international trade.

U.N. COMMITTEE ON THE PEACEFUL USES OF OUTER SPACE (COPUOS)

The 53-member COPUOS, its Scientific and Technical Subcommittee, and its Legal Subcommittee all met during FY 1988. For several decades after its inception in 1958, the Committee worked successfully on the exchange of scientific information and negotiated four widely accepted conventions that form the basis of international space law. However, the scientific and legal work of the Committee has suffered in recent years with debates becoming increasingly political. There has been a tendency to

seek to involve the Committee in disarmament and other matters that the U.S. and other western nations believe are fundamentally at odds with the committee's mandate, and with the consensus procedure that governs its work.

At the February 1988 Scientific and Technical Subcommittee, member states focused on the practical applications of remote sensing and satellite communications of particular relevance to the needs of developing countries. The Subcommittee decided to pay particular attention in 1989 to the use of space technology for combating environmental problems. The Legal Subcommittee met in March 1988 to consider questions relating to the use of nuclear power sources in space, utilization of the geostationary orbit and the delimitation of outer space. After two years of debate, the subcommittee agreed on a new agenda item for dealing with the application of the principle that space exploration should be carried out for the benefit of all countries, taking particular account of the needs of developing countries. The U.S., with the support of other western countries, in 1988 continued efforts to make the work of COPUOS and the Subcommittees more relevant to the present state of space exploration. To this end, at its June 1988 meeting, member states accepted a U.S. proposal to add to the COPUOS agenda an item on the secondary applications of space technology for addressing problems on earth.

U.N. ECONOMIC COMMISSION FOR EUROPE (ECE)

The Senior Advisers on Science and Technology (SAST), formed in 1972, is a principal subsidiary body of the ECE. It is designed to promote East-West cooperation and exchange in science and technology. The work of the SAST has been of limited value to the U.S.; however, we remain interested in the potential role the Senior Advisers could play as an effective multilateral forum in Europe for cooperation in science and technology.

The U.S. and other western countries initiated an effort several years ago to make SAST more effective, and to restore a sense of balance to its work program. The U.S. has made a number of proposals that have been developed further. Above all, the U.S. has urged the Senior Advisers to undertake a critical examination of the work in order to purge the program of projects that have outlived their usefulness, are of only marginal value, or never were useful. The member states of the European Community (EC) strongly support these efforts. In contrast, the East European delegations have sought to justify maintaining virtually every area of the work program, and to expand it in high technology areas.

In 1988, the Senior Advisers held a debate on the safety aspects of biotechnology. They also agreed to have an exchange of views at its next session on the transition from an industrialized and technological society to a scientific and information society.

NATO SCIENCE COMMITTEE

The NATO "Third Dimension", the Civil Science Programme, which complements the military and the political-economic dimensions, has developed substantially since its inception in 1958. The Science Programme emerged in recognition of the importance to defense of strong capabilities in science and technology in all member countries, and of the need for broad co-operation to achieve such capabilities. The Science Committee has implemented the program by focussing on scientific and technological exchanges, emphasizing the international mobility of scientists throughout the alliance. In 1980 this scientific cooperation was

supplemented by a special program, Science for Stability (SFS), to assist Greece, Portugal and Turkey in enhancing their individual scientific and technological capabilities and their management experience in these areas.

A key feature of the administration of the Science Programme is the heavy voluntary involvement of the international scientific community in the peer review process accompanying each grant recommendation. At any time, more than 100 individual scientists from the NATO nations, chosen on the basis of their scientific qualifications, serve without remuneration on the several advisory and selection bodies established by the committee. In addition they were assisted by well over 2,000 written reviews prepared by eminent specialists on individual grant applications.

The original main sub-programs, developed to achieve the Science Committee's objectives, have continued to demonstrate their validity and still form the framework for the NATO Science Programme. They are:

- The Science Fellowships Programme which increases the quality and quantity of trained scientists by stimulating the exchange of post-graduate and post-doctoral students between member countries;
- The Collaborative Research Grants Programme which increases the effectiveness of national scientific efforts by promoting the sharing of expertise and scientific facilities;
- The Advanced Study Institute Programme which fosters high-level education in space and technology, and encourages international linkages; and
- The Advanced Research Workshop Programme which brings together small groups of advanced researchers for exchange of information and planning purposes.

CHAPTER 5: SELECTED TOPICS IN INTERNATIONAL SCIENCE AND TECHNOLOGY

ACID RAIN

Acid rain, in the view of many, is a significant environmental concern. This has made it an important international issue--particularly among European countries and between the U.S. and Canada--because emissions which contribute to its formulation cross borders, measures to reduce such emissions could have considerable adverse economic impacts.

The Physical Phenomenon-A Brief Overview

All rainfall is somewhat acidic in character; the principal natural factor is atmospheric carbon dioxide, which causes a slightly acidic rainfall of pH 5.6 even in the most pristine environments. Natural rainfall, without man-made pollutants, in the eastern U.S. is estimated to have a pH of 5.0-5.2. In some parts of the world, however, the acidity of rainfall has fallen below the natural ranges. In the northeastern U.S., for example, the average pH of rainfall is 4.6.

Man-made emissions of sulfur dioxide and nitrogen oxides contribute to the acidification of rainfall. They are transformed into acids in the atmosphere by oxidants, and they often are transported hundreds of miles before being deposited as acidic rain, snow, dust or gas. All these wet and dry forms of acid deposition are known loosely as acid rain. In the U.S., electric utilities account for almost 70 percent of the sulfur dioxide emissions. The major source of nitrogen oxides are transportation, about 45 percent, and electric utilities, about 35 percent. The potential environmental effects of acid rain frequently are classified into four categories: aquatic, terrestrial, materials deterioration and human health. Within each category, the nature and extent of potential damage caused by acid rain depends upon the quantity deposited or the concentration as well as upon the sensitivity of the area receiving the acid deposition and the receptors exposed to it.

The adverse effects of acid rain have been most thoroughly documented in some aquatic ecosystems. According to the 1987 Interim Report of the National Acid Precipitation Assessment Program (NAPAP), acidic deposition has contributed to the acidification of some lakes and streams in sensitive regions in the U.S. The regions with the highest percentage of acidic lakes are (1) the Adirondack Mountains region, the Upper Peninsula of Michigan, and the Pocono Mountains region, where 2 to 6 percent of the total lake areas and 10 percent of the lakes have a pH less than 5.0; (2) southern New England, where over 6 percent of lake area and 5 percent of lakes are acidic; and (3) Florida, where national acidification is high in 12 percent of the lake area and 12 percent of the lakes. There essentially are no lakes or reservoirs in the mountainous West, northeastern Minnesota and the Southern Blue Ridge area of the Southeast with a pH less than 5.0 and very few with a pH less than 5.5. Most other sample subregions show less than 0.5 percent of the lake area and less than 1 percent of the number of lakes with a pH less than 5.0. Overall, the portion of the acidity attributable to manmade and natural causes is not well known.

Less is known about acid rain's potential effects on forests. However, according to the NAPAP Report, over the past several years eight cases of apparent regional decline of forests in the U.S. have been suggested as having air-pollution causality. In the two cases of Eastern white pine in the eastern U.S. and southeastern Canada, and Ponderosa and Jeffrey pine in southern California, non-acidic air pollutants (e.g., ozone acting together with one or more other oxidants probably has caused

the damage. For the other six cases, definitive conclusions have not been drawn yet about the relative importance of natural stresses and specific types of acidic and non-acidic air pollution. At current levels of acidic deposition, short-term direct foliar-mediated effects on crops or healthy forests are unlikely. Acidic deposition may have a cumulative effect on trees growing on certain low-nutrient soils, but this effect is expected to be gradual. Researchers have not observed this effect to date in the U.S. at current levels of deposition, but these possibilities are under intensive investigation. Research results have established that acidic deposition in the amounts and concentrations that currently occur in the U.S. has no consistent, demonstrable effect on the yield of agricultural crops, although current levels of ozone (a non-acidic pollutant which plays a role in the formulation of acid rain) appear to reduce yield of some crops.

Acid rain also can damage man-made materials. However, as materials naturally deteriorate with time, it is difficult to differentiate the effects of acid rain from damage caused by normal weathering, and from direct effects of SO_2 . As a result, the potential effects of acid rain in materials damage is still a major unknown.

The potential effects of acid rain on human health are unclear. Inhaling acidic particles in acid fog may pose some health risk. Acid rain also may indirectly affect human health when it mobilizes toxic trace metals such as aluminum and mercury. When dissolved in acidic waters, these metals can be ingested by fish and other animals, building up in the human food chain. Further research is underway to determine whether these possibilities constitute real health risks under ambient U.S. conditions.

The U.S. and Europe

Diplomatic problems related to cross-boundary air pollution, including acid rain, first surfaced in Europe in the 1950s when the Scandinavian countries became concerned about industrial emissions travelling across the North Sea. Since then, acid rain has become a major concern in much of Europe. The Convention on Long-Range Transboundary Air Pollution (LRTAP) was signed in 1979 by 35 countries, including the U.S., Canada and the European Community. Parties to the Convention agreed to "endeavor to limit and, as far as possible, gradually reduce and prevent air pollution including long-range transboundary air pollution". The Convention entered into force in 1983, with the U.S. as a signatory.

A protocol to the Convention controlling sulfur dioxide emissions was signed by 21 countries, including Canada, in 1985 and entered into force in 1987. The sulfur dioxide protocol binds signatory governments to reduce their 1980 sulfur dioxide emissions levels by 30 percent by 1993. The U.S., the U.K. and Poland were among a number of parties to LRTAP that did not sign the protocol. The U.S. did not sign because it did not consider the required 30 percent reduction justified based on scientific knowledge and because the protocol did not take into account the U.S. leadership in instituting extensive existing control programs in the U.S. U.S. sulfur dioxide emissions declined by 29 percent between the peak year of 1973 and 1983, and by 10 percent between 1980 and 1983.

Discussions on a protocol under LRTAP to control emissions of nitrogen oxides were begun in 1985 and formal negotiations began in 1987. The nitrogen oxide protocol was signed by the U.S. and other countries in October 1988 at Sofia, Bulgaria. The main provisions of the protocol include: (1) a freeze of on

nitrogen oxides emissions at 1987 levels by December 31, 1994; (2) the use of best available technologies on new sources when economically feasible; (3) a commitment to endeavor to develop a follow-on protocol for nitrogen oxides to meet environmental effects control standards, instead of emissions control standards in the present protocol, for implementation in 1996; (4) the exchange of information on control technologies; and (5) increased availability of unleaded gasoline in Europe.

The U.S. and Canada

Acid rain has been a major item on every Canadian agenda for the last several years and no recent issue between the two countries has been more resistant to resolution. The first joint U.S.-Canada effort to deal specifically with acid rain was the Bilateral Research Consultation Group established in 1978 to report on the extent and significance of long-range air pollution. Additionally, in 1978 the U.S. Congress called upon the President to "make every effort to negotiate a cooperative agreement with the Government of Canada aimed at preserving the mutual airshed of the United States and Canada". This, in turn, led to the Joint Statement on Transboundary Air Quality of July 16, 1979, and the Memorandum of Intent of August 5, 1980 in which the two governments explicitly recognized the seriousness of acid rain and accepted a mutual commitment to work toward a bilateral agreement as soon as possible. However, a bilateral air quality agreement was not reached under the Memorandum of Intent because of fundamental scientific differences between the two sides on the nature and effects of acid rain and negotiations ended in 1983.

In March 1985, the President and Canadian Prime Minister Mulroney met at Quebec City to discuss a wide range of bilateral issues, including the environment. Both leaders acknowledged publicly that acid rain was a serious concern affecting bilateral relations and each appointed a Special Envoy to review jointly the acid rain issue and to make recommendations for consideration at their next meeting in the Spring of 1986. The Envoys issued a joint report which was endorsed by the President and Prime Minister in March 1986.

The Special Envoys made three basic sets of recommendations to enable the two countries to resume a fruitful dialogue and take constructive actions to reduce the stress this issue had created without immediately abandoning major policy positions. First, they recommended that the U.S. government "implement a five-year, five-billion dollar control technology commercial demonstration program, with the federal government providing half the funding for projects which industry recommends, and for which industry is prepared to contribute the other half of the funding". The primary purpose of the program is to establish cheaper and more efficient technologies that might support future sulfur dioxide and nitrogen oxides emissions control programs. However, the Envoys also stated that the program should result in some near-term reductions in U.S. air-borne emissions affecting Canadian ecosystems.

Second, the Envoys recommended measures to enhance bilateral cooperation and consultation, including establishment of a bilateral advisory and consultative group on transboundary air pollution. Third, they recommended a cooperative program of research in areas of special value to decision makers in guiding the development of environmental policies.

The U.S. has actively implemented the recommendations of the Special Envoys. For example, regarding the innovative control technologies program, the Administration has requested the full \$2.5 billion in federal funding recommended by the

Envoys. To do this, it has implemented the first phase of the Clean Coal Technology Program and initiated the second phase. Also, the Secretary of DOE has established an advisory panel, with Canadian and U.S. public participation, to advise on the Department's funding and selection of innovative control technology demonstration projects.

When the President and Prime Minister met at Ottawa in April 1987, they agreed to consider a Canadian proposal for an accord on acid rain. Canadian officials presented their proposal in May 1987 at a meeting of the U.S. and Canadian Bilateral Advisory and Consultative Group (BACG). A central element to the Canadian proposal was the establishment of specific sulfur dioxide emissions reduction targets in the U.S. and a negotiated timetable for achieving them.

In January 1988, the U.S. presented a proposed framework accord to Canadian officials. The proposal called for a more comprehensive and integrated dialogue on air pollutants, allowed both countries to jointly assess the scientific data as it became better understood, and enabled the evaluation of the success of the clean coal technology program. It did not contain emissions targets and timetables because the U.S. position remains that further mandatory reductions in emissions are not justified by current scientific understanding of the causes and effects of acid rain.

President Reagan and Prime Minister Mulroney discussed the issue again in April 1988 during their meeting at Washington. The Prime Minister gave the President a clarification of the Canadian proposal and the President asked the Secretary of State and the EPA Administrator to examine the proposal and directed that the matter be pursued within diplomatic channels.

ACQUIRED IMMUNE DEFICIENCY SYNDROME (AIDS)

The impact of AIDS continues unchecked as the number of cases increase in virtually all areas of the world. There are promising developments in the treatment of AIDS, and at least one drug has demonstrated efficacy in slowing the otherwise inexorable course of the disease. The development of an effective vaccine is at best several years in the future. Consequently, at the present time educational campaigns to modify high-risk behavior are the only means at hand to control the spread of the disease. In this regard, there is evidence that new infections in some high-risk groups are declining as the result of educational programs.

The virus causing AIDS has been named Human Immunodeficiency Virus (HIV). The virus is designated HIV-1 because a second human immunodeficiency virus, HIV-2, has been discovered. HIV-2 was originally confined to West Africa, may be less capable of causing disease, and is structurally related to a macaque monkey virus. Extensive research efforts are necessary to delineate the relationships between the viruses. It is of more than casual interest that genetic nucleotide, i.e., analysis of HIV-1 reveals that it is unique and not related to other lentiviruses and is not a hybrid of any known virus. HIV-1 is not a man-made recombinant. The Soviet disinformation campaign's contention that the virus was man-made in the U.S. has been scientifically refuted.

The U.S. fully supports the World Health Organization's Global Programme on AIDS (GPA). The U.S., through the Agency for International Development (USAID), contributed \$15 million to the GPA in FY 1988. Another \$15 million was allocated for bilateral programs in developing countries. In addition, the

U.S. has paid in full its 1987 assessed contribution to the World Health Organization. On June 17, 1988, USAID sponsored a workshop on preventive interventions for approximately 140 participants including 74 scientists and health officials from developing countries who were directly sponsored by USAID. The workshop followed the IVth International Conference on AIDS which convened at Stockholm on June 12-16. Research programs on AIDS continue to be developed and expanded. The Department of Health and Human Services (DHHS) through the National Institutes of Health (NIH) and the Centers for Disease Control (CD) has funded studies in all aspects of AIDS from basic science to vaccine development. The Department of Defense performs surveillance on military personnel and supports numerous research efforts. The U.S. leads the world in allocations for research, foreign assistance and scientific expertise in the study of AIDS.

United States' policy mandates continued surveillance of military personnel. Those who test positive for HIV will not be assigned overseas. Requirements for testing for AIDS or for certificates of negative tests have been established by several countries. The U.S. government does test those seeking permanent residence (e.g., immigrants and refugees), but does not routinely test temporary visitors including students. This policy is in keeping with conclusions of the World Health Organization and has been communicated to the various governments proposing HIV-related travel restrictions.

Estimating the demographic, economic, social and political impacts in individual countries is hampered by insufficient data. The U.S. government supports the development of a model for the purpose of making projections on the international impacts of AIDS.

BIOLOGICAL DIVERSITY/TROPICAL FORESTS/WILDLIFE

The United States views biological diversity as a broad issue involving plants, animals and habitats. In FY 1988, the Department of State undertook and participated in a wide range of bilateral and multilateral cooperative activities related to biological diversity in an overall broad context, as well as addressing the conservation of tropical forests, endangered species, migratory wildlife and wetlands management.

Biological Diversity

The Department cooperated throughout FY 1988 with USAID to promote activities concerned with the maintenance of biological diversity. Of particular note is U.S. involvement in an initiative by the International Union for Conservation of Nature and Natural Resources (IUCN) developing a treaty for the in situ conservation of germ plasm. The State Department has commented on the first draft text which was informally aired at the IUCN General Assembly convened at San Jose in February 1988. USAID has provided \$40,000 in FY 1988 to support work on a revised treaty text for consideration at a second informal meeting in early FY 1989.

Tropical Forests

The U.S. was actively involved in FY 1988 in international efforts to promote conservation and sustainable use of tropical forests. In November 1987 and June 1988, the U.S. participated with 42 of the world's tropical forest producing and consuming nations in the second and third meetings of the International Tropical Timber Organization (ITTO). As the first international commodity agreement to have a conservation

U.S. Contributions to Selected International Organizations - FY 1988

Organization	Assessed or Pledged	(in \$ Millions)	Contributions
Food and Agriculture Organization	57.3		25.0
International Atomic Energy Agency	33.8		33.8
IAEA Operational	14.5		14.5
IAEA Safeguards	6.4		6.4
International Civil Aviation Organization	7.6		6.9
International Maritime Organization	0.6		0.6
International Telecommunication Union	5.1		5.1
NATO Science Activities	4.6		4.6
Organization for Economic Cooperation and Development	34.0		34.0
World Health Organization	62.8		62.8
Pan American Health Organization	36.3		31.7
World Meteorological Organization	5.8		5.8
WMO/Voluntary Contributions Program	2.0		2.0

mandate, the ITTO could have an important role to play in protecting the earth's remaining tropical forests. U.S. priorities for sustainable forest development were reflected in decisions taken at the two meetings, which included the approval of approximately \$5.8 million in tropical timber related projects. Nearly \$2.4 million of this amount was approved for studies on improved natural forest management in Brazil, Malaysia and Central West Africa.

The Department of State, the U.S. Forest Service and USAID participated in the ninth session of the Committee on Forestry of the United Nations Food and Agriculture Organization (FAO), and the sixth session of the Tropical Forestry Action Plan (TFAP) Forestry Advisors during May 1988. Consistent with U.S. priorities, both sessions highlighted the importance of sustainable tropical forest use and ecosystem conservation. FAO has provided an excellent leadership role regarding TFAP implementation, especially in view of the USAID support for, and participation in, forestry sector reviews in TFAP countries.

United States participation in recent follow-up efforts after the International Tropical Forest Strategy Conference, which convened at Bellagio, Italy in July 1987, also is relevant to TFAP objectives. During FY 1988, the United Nations Development Program, World Bank and Rockefeller Foundation jointly sponsored the formation of an international task force to examine mechanisms for strengthening forestry research throughout the tropics. The task force, which includes three Americans, met at Washington in May 1988 and is scheduled to present its recommendations at a follow up meeting early in FY 1989.

Ongoing bilateral cooperation through the U.S.-Panama Joint Commission on the Environment (JCE), established under Article VI of the 1977 Panama Canal Treaty, continued to enhance efforts to focus the attention of both governments on the critical importance of conserving forests of the Canal watershed. With Department of State support, the JCE convened its sixteenth session in February 1988 in Panama, receiving reports from the Panama Canal Commission and several agencies of the Panamanian government. Although suspension of U.S. assistance to Panama has led to the termination of some environmental programs, including a major USAID natural resource management project, Panama appears to be making an effort to continue ongoing conservation programs at some level of activity.

At the national level, the Department of State continued to actively co-chair with the U.S. Forest Service meetings of the U.S. Interagency Task Force on Tropical Forests. The four meetings held in FY 1988 included participation by USAID, the National Park Service, U.S. Fish and Wildlife Service, Bureau of Land Management, Smithsonian Institution, Overseas Private Investment Corporation, Council on Environmental Quality and National Aeronautics and Space Administration (NASA). The Department also has followed with interest the development of debt-for-nature initiatives such as the "debt swap" agreements negotiated with Bolivia, Costa Rica and Ecuador by U.S. nongovernmental organizations. These agreements facilitate protection and concentration of habitat and species, by allowing countries with debts in foreign currencies, which they find difficult to repay, to have the debts reduced by setting aside wildlands for permanent protection.

Wildlife

The U.S. continued to strengthen international efforts during FY 1988 to protect rhinoceros populations. Cooperative efforts between USAID, World Wildlife Fund and Department of State resulted in the allocation of \$100,000 in projects specifically designed to conserve rhinoceros habitat and to examine market alternatives to rhinoceros horn in the dagger industry. Contacts with the General Services Administration and the Department of Defense were pursued to secure excess government-owned property for assisting park rangers in countries with significant rhinoceros populations. In addition, the State Department petitioned and won approval from the Treasury Department for the importation of an orphaned baby rhinoceros from South Africa.

The U.S. was elected to the chair of the Convention on International Trade of Endangered Species of Wild Fauna and Flora (CITES) Standing Committee in the late summer of 1987, and has devoted significant attention to oversight of the CITES Secretariat and its operations. U.S. embassies and missions overseas were utilized in developing approaches to foreign governments on important wildlife issues such as elephant ivory, reservations to the Convention, and EC Accession. The State Department also worked closely with the U.S. Fish and Wildlife Service to secure the return to the United States and rehabilitation to its wild habitat of a bald eagle found in Ireland.

Through the World Heritage Convention, the Department of State and the National Park Service have encouraged the designation and protection of outstanding areas which contain the natural habitat of endangered species. In December 1987, Sundarbans National Park, India's largest tiger reserve, was inscribed on the World Heritage List. Financial assistance for protection against poaching was provided to the Selous Game Reserve in Tanzania from the Convention's trust fund.

BIOTECHNOLOGY

Biotechnology is the use of living organisms or their components to make or modify products, to improve plants or animals, or to develop microorganisms for specific use. As such, biotechnology relies both on the basic research contributions of diverse scientific and engineering fields and on the application of these fundamental principles to the processing of materials by biological agents to provide goods and services. Biotechnology is not an industry per se, but rather a tool or enabling technology employed by diverse commercial sectors that include agriculture, chemicals, waste management, energy, medical diagnostics, therapeutics, and pharmaceuticals, among others.

Biotechnology is one of the few high technology areas in which the U.S. maintains a lead over its international competitors. In the international arena the U. S. attaches high priority to maintaining a milieu that supports innovative research and development in this field to proceed, while protecting public health and the environment. The U.S. seeks to eliminate unnecessary barriers to international trade and to ensure recognition of intellectual property rights..

A key U.S. foreign policy goal is the international development and harmonization of regulatory approaches, based on a scientifically determined likelihood of risk and consistent with U.S. domestic policy for the development and commercialization of natural and genetically modified organisms

and their products. In the U.S. view, the regulation of organisms should be based on the risks inherent in the product (i.e., a product-based approach) rather than on the process, such as genetic engineering, by which the product is produced (i.e., a process-based approach). Equally necessary is the assurance that human health and the environment will be protected as the international commercialization of biotechnology advances.

United States' goals for the international harmonization of patent policies for biotechnology, a field that has unique needs, include the adequate protection of intellectual property rights for both processes and products, and the patent potential of microbial, plant and animal life. Several important developments helped the U.S. government advance its goals in international biotechnology in FY 1988.

The OECD Group of National Experts on Safety in Biotechnology met in April 1988, to exchange information on national developments since their previous meeting and to fashion a future work program. Their last meeting in December, 1985, resulted in a 1986 OECD publication entitled Recombinant DNA Safety Considerations. This document included a science-based approach known as good industrial large scale practice (GILSP) for the contained use of low-risk genetically modified organisms. At the April 1988 meeting, information was exchanged on member countries' progress in developing national review systems and on experiences with medical, agricultural and environmental biotechnology research and products. The group adopted proposals for its future work program consistent with U.S. interests, including: development of good developmental practice (GDP) for small-scale field-testing; refinement of GILSP for industrial production; exchange of information and determination of database needs; heightened public acceptance of biotechnology; and further refinement of definitions used in regulatory language.

The Commission of the European Economic Communities (EC) proposed in March 1988, three directives dealing with biotechnology regulation, viz., the directives on the Contained Use of Genetically Modified Organisms, the Deliberate Release of Genetically Modified Organisms, and the Protection of Workers. Although the directives have yet to be adopted by the EC Council, the potential impact of the directives on U.S. competitiveness in the EC biotechnology market is one of the issues currently under discussion by the U.S.-EC High Technology Working Group chaired by the U.S. Trade Representative (USTR). In addition, the U.S. government is reviewing the documents under the aegis of the Federal Coordinating Council on Science, Engineering, and Technology and will submit consensus comments on the directives to the EC in early 1989.

The initiation of international biosafety guidelines, especially relevant to the developing world where few national regulations exist, occurred in several multilateral fora in FY 1988. In addition to the OECD and EC efforts, biosafety guidelines or principles for biotechnology regulation are being developed with U.S. representation by such multilateral groups as the U.N. Industrial Development Organization/World Health Organization/United Nations Environment Program (UNIDO/WHO/UNEP) in U.N. (UN), the Scientific Committee on Problems of the Environment/Committee on Genetic Experimentation (SCOPE/COGENE) in the International Council of Scientific Unions (ICSU), the Inter-American Institute for Cooperation in Agriculture (IICA) in Latin America, and NATO, among others. U.S. policy is consistent with the conclusions of a 1987 U.S. National Academy of Sciences (NAS) report,

Introduction of Recombinant DNA-Engineered Organisms into the Environment: Key Issues, and a 1988 Office of Technology Assessment (OTA) report, New Developments in Biotechnology, 3, Field-Testing Engineered Organisms: Genetic and Ecological Issues. Both U.S. policy and the reports recommend a product-based rather than process-based regulatory approach. Although most multilateral guidelines are largely consistent with U.S. policy on biotechnology regulation, a principal concern of the U.S. remains the unnecessary proliferation of international guidelines that may require subsequent harmonization. This point was made by the U.S. delegation to the First Special Session of the Governing Council of UNEP in March 1988. The U.S. urged that in areas such as microbial resources and related biotechnologies, where UNEP lacks the technical resources to expand its role into the development of regulatory guidelines, UNEP should limit itself to gathering and making available data through its existing network.

As the result of negotiations in the Coordinating Committee on Multilateral Export Controls (COCOM), multilateral controls on exports of catalysts used in biologic/chemical warfare applications entered into force on April 29, 1988. The U.S. government will continue to work with its allies in COCOM to ensure that the transfer of new biologic/chemical warfare technologies are controlled.

An area of biotechnology receiving considerable attention in FY 1988 was that of mapping and sequencing the human genome. Both the NAS and OTA published in 1988 extensive reports on the feasibility of such a project. The immediate goal would be to produce genetic linkage. Physical maps of increasingly higher resolution, with a fully detailed map of the chromosomes will require about a decade for completion. The ultimate goal would be to determine the sequence of nucleotides constituting the chromosomal DNA itself, that is, the precise chemical makeup of all individual genes on the map. This project will work new methods developed for molecular biology with advancement in instrumentation that will range from new computer chip design to robotics. The benefits of a map would include the facilitated identification of genes associated with specific diseases, with medical and commercial implications for diagnosis, treatment and prevention. The map and sequence data also would help elucidate fundamental questions of genetic junction, genome organization, cellular growth and differentiation, and evolutionary biology. The reports point out that mapping genes, both human and nonhuman, has been an international effort for many years. International agreements for databases, especially DNA sequence data, and collaborations on gene mapping have been in operation for several years. However, no foreign government has yet made a formal commitment to mapping and sequencing the human genome, although discussions to this effect have taken place in the EC and Japan.

In April 1988, the U.S. participated in the Fifth Conference on Bioethics of the World's Seven Main Industrial Countries in which scientific, legal and ethical issues associated with human genome sequencing were discussed. In addition to issuing several ethical recommendations for protecting the rights, interests and privacy of individuals in various aspects of gene therapy, the conference advocated concerted national and international efforts for rapid generation and dissemination of knowledge in this field.

USAID supports collaborative research programs which provide the benefits of biotechnology in agriculture and health care in developing countries. The strengthening of collaboration in biotechnology, achieved through effective

linkages with the International Agricultural Research Centers (IARCs), was the theme of a recent USAID-sponsored conference seeking to apply U.S. research towards specific constraints of international agriculture.

The Bureau for Science and Technology in USAID through its Office of Agriculture has awarded two cooperative agreements for the development of recombination-derived animal vaccines. The first of these would produce a heat stable vaccinia-vectored vaccine for rinderpest, a deadly disease of cattle in many African nations. This would eliminate the need for the costly chain of refrigeration units required to use the conventional vaccine. The second project would produce a genetically engineered vaccine for anaplasmosis and babesiosis.

Other USAID-supported research projects seeking to apply biotechnology include biologic nitrogen fixation, tissue culture, and the development of diagnostic probes to detect plant pathogens. The NIFTAL project attempts to increase the efficiency of nitrogen fixing microorganisms through biotechnology, while the Tissue Culture for Crops Project explores selection for salt tolerant plants at the cellular level. Diagnostic probes have been developed and are used in the field by the International Potato Center.

The Office of Health in USAID supports a coordinated network of research directed towards the development of a malaria vaccine. Biotechnology is used in identifying and producing antigens which constitute the base for developing such a vaccine. The DiaTech project supports research to devise diagnostic methods that use monoclonal antibody and DNA hybridization techniques that will permit development of low cost, usable field kits for diagnosis of diseases in developing countries.

The Office of Population in USAID supports biotechnology research in two major areas: reproductive immunology with the goal of developing a contraceptive vaccine; and isolation and purification of new gonadal factors with potential as contraceptives in both males and females. Research activities involve the utilization of molecular biology, recombinant DNA technology, monoclonal antibody technology and various techniques for identification and large-scale purification of hormonal proteins. All activities are supported through cooperative agreements with two organizations which have large programs in the contraceptive development and clinical trials area. The goal of these organizations is to enhance the ability of couples worldwide to choose voluntarily the number and spacing of their children.

GLOBAL ATMOSPHERIC ISSUES: CLIMATE CHANGE

As scientific research has advanced over the past decade, the question of human's impact on the global environment has become an issue of intense interest both nationally and internationally. Of particular concern are scenarios of global climate change as a result of increasing levels of carbon dioxide and other so-called "greenhouse" gases in the atmosphere. Significant uncertainties remain about the magnitude, timing and, in many instances, the direction of change of regional impacts of climate change. During FY 1988, the U.S. government has made major contributions to international efforts to set up a process to narrow those uncertainties.

Global climate change has broad implications for all societies, affecting sectors as diverse as agriculture, energy, health and water and natural resources. Thus, both climate change and possible response strategies affect many foreign policy interests, including agricultural trade, development assistance and energy security. The expected impacts both of climate change and of possible adaptation or mitigation measures should be considered carefully in assessing the costs and benefits of possible response strategies. Accordingly, the U.S. is engaged in a wide range of activities--national, bilateral and multilateral--to advance the science and identify and evaluate possible response strategies.

Intergovernmental Panel in Climate Change

The U.S. strongly supported the establishment by the World Meteorological Organization (WMO) and the United Nations Environment Program (UNEP) of an Intergovernmental Panel on Climate Change (IPCC) for the purpose of providing a focused intergovernmental forum to consider the many aspects of this complex issue. Over the past year, U.S. government representatives have worked with WMO and UNEP in planning the initiation of the panel. The panel met for the first time in November 1988, and the U.S. participated actively in its work. OES Assistant Secretary Bernthal led the U.S. government's representation on the panel.

Under the auspices of the panel, reviews of the scientific knowledge of natural and induced climate change, possible societal responses, and their impact on society will be carried out. This review should provide governments with analyses of current scientific evidence on climate change and resulting impacts on natural and human systems.

Multilateral Scientific Cooperation

The U.S. continues to participate actively in the World Climate Program (WCP), which was launched in 1979 under the auspices of WMO, UNEP and the International Council of Scientific Unions (ICSU). WCP is placing increasing emphasis on the decades-to-centuries time scale in its effort to narrow the range of uncertainties regarding climate change and to refine prediction capabilities.

On a broader scale, the U.S. governmental and non-governmental scientific community is participating actively in planning for ICSU's International Geosphere-Biosphere Program (IGBP), a major long-term effort to describe and understand the interactive physical, chemical and biologic processes that regulate the total earth system, the changes that are occurring in this system, and the manner in which they are influenced by human activities. The IGBP, in which the National Academy of Sciences will lead U.S. scientific participation, will contribute importantly over the longer term to the narrowing of uncertainties regarding global climate change.

During 1988, the Committee on Earth Sciences (CES) developed a global change research strategy that is consistent with the IGBP research plans and will allow the U.S. government to play an important role in this effort. This strategy report entitled "Our Changing Planet: A U.S. Strategy for Global Change Research" will accompany the FY 1990 President's budget. The CES is an U.S. Federal interagency group under the President's Science Advisory's Federal Coordinating Council for science, engineering, and technology.

U.S.-Soviet Summits

At the Washington Summit in December 1987, President Reagan and General Secretary Gorbachev approved a bilateral initiative to pursue joint studies in global climate and environmental change, including a detailed study on the climate of the future. Cooperative research with the Soviet Union on climate has been conducted for several years under the 1972 bilateral Agreement on Cooperation in the Field of Environmental Protection. Following through on the Summit initiative, over 30 projects, exchanges and joint experiments are being carried out during 1988. Also pursuant to the Summit initiative, the U.S. and the Soviet Union are negotiating proposed projects for the acquisition, coordination and exchange of space-based data related to global climate change under the 1987 bilateral space agreement.

At the Moscow Summit in June 1988, the two leaders expressed their satisfaction with activities since the Washington summit in expanding cooperation in this field. At both Washington and Moscow, the leaders underscored the need to promote both bilateral and multilateral cooperation in the increasingly important area of global climate and environmental change. Thus, the cooperation reflects both the contribution such activities can make to bilateral relationships and the contribution bilateral work can make to the global effort.

Toronto Summit

The seven-nation economic Summit at Toronto in June 1988 agreed that protection of the environment is essential and endorsed the concept of sustainable development. The summit participants listed global climate change first among areas which "require priority attention", and they encouraged establishment of the Intergovernmental Panel on Climate Change.

OECD

In April 1988, the Environment Committee of the OECD approved a program to begin work on an evaluation of the socio-economic implications for OECD countries of potential global climate change caused by the continuing build-up of carbon dioxide and other greenhouse gases, along with policy options for mitigating any affects. This will involve cooperation with the International Energy Agency in order to evaluate the implications of climate change for energy policy, and a comparative analysis of methodologies to analyze socio-economic impacts of climate change.

Bilateral Assistance

Numerous USAID projects in the energy and forestry sectors contribute to reducing emissions of carbon dioxide, although the original motivations for those projects were economic and environmental considerations other than the global warming issue. In the energy sector, these projects deal most importantly with energy efficiency and renewable energy systems. For example, USAID energy conservation projects in Egypt, Morocco, Pakistan and the Philippines focus on transfer of proven energy-efficient industrial technologies, design of national energy demand programs, and improvements in the power of cost-effective renewable energy technologies involves the promotion of the use of biomass for energy production, using agricultural and forest residues that are otherwise largely wasted. In other USAID projects, additional renewable

technologies are being promoted, including solar, wind, geothermal and hydropower. Recently, USAID has begun to promote the use of natural gas for power production, which generates less carbon dioxide per unit of electricity than the use of other fossil fuels.

USAID efforts in forestry included 132 projects in 43 countries in 1987, helping countries formulate improved natural resource management policies which facilitate better management of existing forests and increase reforestation. USAID and other U.S. agencies also actively participated in development of the global Tropical Forestry Action Plan under the auspices of the UNFAO. Under the plan, donors and host-country governments will conduct forestry sector reviews in more than 60 countries within the next seven years.

Protection of the Ozone Layer

Substantial progress was made during FY 1988 in worldwide cooperation to protect the stratospheric ozone layer. The U.S. government continued to be a leader both in advancing scientific understanding of ozone depletion and its possible effects, and in promoting coordinated international action to control ozone-depleting substances.

On April 21, 1988, the U.S. ratified the 1987 Montreal Protocol on Substances that Deplete the Ozone Layer, which provides for reductions in production and consumption of the principal ozone-depleting chemicals. As of July 31, 1988, 37 countries had signed the protocol and six had ratified. Many other nations are moving ahead with their ratification processes. The protocol will enter into force January 1, 1989, provided it has been ratified by at least 11 nations representing at least two-thirds of the global consumptions of the controlled chemicals.

The 1985 Vienna Convention for the Protection of the Ozone Layer, which the U.S. ratified in August 1986, has now been ratified by the requisite 20 nations and entered into force on September 22, 1988. The Convention provides for international cooperation in research, monitoring and information exchange, and is the framework agreement for the Montreal Protocol.

In consultation with nations around the world, the U.S. has urged all countries to ratify the Protocol promptly. As the U.S.-Soviet Summits and the seven-nation economic summit at Toronto, President Reagan and other world leaders noted the importance of protecting stratospheric ozone. U.S. Ambassadors and other senior U.S. officials have raised the issue with counterparts at Washington and abroad. Representatives of the U.S. government and U.S. industry have held technical discussions with counterparts in Japan, China, Korea and Europe. In January 1988, more than 80 foreign participants representing 22 countries attended the EPA conference and trade fair on alternatives to ozone-depleting substances.

Cooperative international action to protect stratospheric ozone is a foreign policy goal because unilateral U.S. action would not be effective in protecting a global resource which is essential to the health and welfare of the citizens of the U.S. In addition, cooperative action minimizes trade distortions which would result from uneven application of controls on the production and use of ozone-depleting chemicals.

A precedent-setting aspect of the protocol is its provision for periodic review of its control measures in order to consider the implications of new scientific, environmental, technical and economic developments.

INTELLECTUAL PROPERTY RIGHTS

A reassessment of provisions in S&T agreements for the protection of intellectual property rights were initiated in response to the Federal Technology Transfer Act of 1986 and Executive Order 12591.

Specifically, the Federal Technology Transfer Act states that: "The laboratory director in deciding what cooperative research and development agreements to enter into shall...take into consideration whether or not such foreign government permits United States agencies, organizations, or other persons to enter into cooperative research and development agreements and licensing agreements". Executive Order 12591 of April 10, 1987 further elaborates that "...when negotiating or entering into cooperative research and development agreements...shall...give appropriate consideration as to whether those foreign governments have policies to protect the United States intellectual property rights..."

Most scientific and technological agreements prior to FY 1988 contained a general article regarding intellectual property rights. The one contained in Article V, paragraph 2 of the U.S.-Japan Agreement signed in 1980 was typical:

The two Governments shall give due consideration to the equitable distribution of industrial property resulting from the cooperative activities under this Agreement and of licenses thereof and to the licensing of other related industrial property necessary for the utilization of the results of such cooperative activities, and shall consult each other for this purpose as necessary.

To fully implement E.O. 12591, a detailed description of the distribution of intellectual property rights that may stem from cooperative activities is being included in any new S&T agreements that potentially will generate intellectual property. One of the first examples of an agreement that contains the new language is the U.S.-Japan Agreement on Cooperation in Research and Development in Science and Technology that was signed at Toronto on June 20, 1988 by President Reagan and Prime Minister Takeshita.

The U.S.-Japan agreement generally is an appropriate model for agreements with nations that have an intellectual property rights regime similar to the U.S. In this agreement, the distribution of rights to intellectual property created under the terms of the agreement recognizes the contributions of each side. As a general principle, in situations where an invention may be generated while a scientist is visiting another facility and it is anticipated that the host side will make a major and substantial contribution to the programs of the cooperative activity, the host side has the right of first refusal to invention rights in all countries. In the case where the host side is not expected to make a significant contribution to the cooperative programs, the visiting side has the first right of refusal in their own country. In very specific situations involving joint research projects with an agreed work scope, the agreement provides for alternative but equitable arrangements. The article also covers the distribution of copyrights, rights to mask works, and the protection of confidential business information that may be introduced during the course of collaboration.

In some cases, an equitable distribution of rights is not possible because of deficiencies in the intellectual property rights protection afforded by the foreign side. Executive

Order 12591 mandates "...appropriate consideration as to whether those foreign governments have policies to protect the United States intellectual property rights..." when entering into cooperative arrangements. Where the deficiencies are relatively minor compared with the benefits of cooperation, it is sometimes possible to satisfy various agency concerns by permitting cooperation with certain conditions. One such condition, used in agreements with a number of countries, is an agreement that, where an intellectual property is of a type for which protection is available under the laws of one country, but not of the other, the party whose laws provide for such protection will own rights worldwide when any property of that type is created under the cooperation activities. In the cases of more egregious deficiencies in intellectual property rights protection by a partner nation, other approaches may be considered.

As each currently existing agreement is considered for renewal, language describing specific and detailed distribution of intellectual property rights conceived under the terms of the agreement is introduced. Thus, all agreements that were negotiated during FY 1988 have had the new intellectual property rights language as a subject of negotiation.

NUCLEAR SAFETY, POST-CHERNOBYL

The April 1986 accident at Chernobyl underscored the extent to which issues of nuclear safety transcend national boundaries and require international cooperation in order to avoid nuclear accidents or to deal with their consequences should they occur. Since Chernobyl, the U.S. has enhanced the promotion of international collaboration for the purpose of preventing and dealing with such accidents. Important nuclear safety initiatives, both bilateral and multilateral, have been made during FY 1988. The following are highlights of international activities by the U.S. in nuclear safety during that period: Following up on an initiative from U.S.-Soviet summit meetings, the U.S., USSR, Japan, and the European Community agreed to participate in a quadrupartite study on the design of an international thermonuclear experimental reactor (ITER) which would harness for peaceful purposes the energy of thermonuclear fusion. The first phase of the ITER design study was completed in November 1988. Other accomplishments in the field of peaceful nuclear cooperation and the prevention of the spread of nuclear weapons to other countries are detailed at length in the annual report to Congress submitted under Section 601 of the Nuclear Non-proliferation Act of 1978.

Bilateral Activities

On April 26, 1988, representatives of the U.S. and the USSR signed a Memorandum of Cooperation in the Field of Civilian Nuclear Reactor Safety under the U.S.-USSR Agreement for Scientific and Technical Cooperation on the Peaceful Uses of Atomic Energy. The Memorandum establishes a joint U.S.-USSR coordinating committee which will meet annually to facilitate a bilateral technical exchange in the following areas with regard to civilian nuclear reactors:

1. regulatory policies, approaches and practices;
2. safety problems related to reactor design, construction, training, operation and management;
3. safety research; and
4. health effects and environmental protection considerations.

This is the first specific nuclear safety agreement between the U.S. and the USSR, and it embraces the idea of developing close cooperative ties in the field of reactor safety expressed in the joint statement of President Reagan and General Secretary Gorbachev at the Washington Summit in December 1987. The first committee meeting was to be held in August at Moscow, during a visit led by Nuclear Regulatory Commission Chairman Zech.

In May, two senior Cuban nuclear officials visited the NRC regional office at Atlanta and toured Duke Power Company's McGuire Nuclear Power Plant in North Carolina. Considering that two nuclear power plants are currently being built by the Soviet Union in the Cienfuegos area of Cuba, the visit was designed for the Cubans to become familiar with U.S. practices in nuclear power operations and public nuclear safety philosophy before the Cuban facility becomes operational in the early 1990s. It is expected that NRC will send a team to Cuba later this year for a reciprocal visit to learn more about the Cuban nuclear regulatory structure and the Cuban facility.

International Atomic Energy Agency (IAEA): the Safety Conventions

The IAEA, through its safeguards programs, is the keystone of the international regime aimed at preventing the spread of nuclear weapons. IAEA plays an important role in coordinating and establishing international cooperative relationships in the field of nuclear safety. This role was emphasized by the Agency's timely and effective response to the Chernobyl accident, which included sponsorship of negotiations in Vienna that produced the international Convention on Early Notification of a Nuclear Accident or Radiological Emergency and the Convention on Emergency Assistance in the Event of a Nuclear Accident.

The U.S., as a 1986 signatory, has agreed to act in a manner consistent with the Conventions until such time as they are ratified. To this end, the U.S. has identified the U.S. Mission to International Organizations in Vienna (UNVIE) and the Department of State Operations Center as primary contacts for notifications, with the emergency centers of the Department of Energy (DOE) and the Nuclear Regulatory Commission (NRC) as additional points of contact. The Conventions are now before the U.S. Senate for advice and consent.

The IAEA is seeking ways to improve support activities under the Conventions. One important consideration is expediting the flow of information to the member states concerning an accident. In January and February of 1988, the U.S. was among several IAEA member nations that participated in limited testing, using the World Meteorological Organization's Global Telecommunication System (GTS), for the purpose of transmitting certain technical data during a nuclear emergency. In lieu of the favorable results, the U.S. is encouraging the IAEA to expand the testing program to include more personnel and more realistic types and quantities of data.

An example of IAEA action under the Conventions was seen following a radiologic accident at Goiânia, Brazil. In September 1987, the Government of Brazil notified the IAEA of a release of radioactive Cesium 137 from a radiotherapy machine that had been taken from an abandoned hospital and disassembled by junk dealers who did not realize its potential hazard. Among the individuals who suffered from over-exposure, 21 required intensive medical care, 10 had serious complications, and there were four fatalities.

In response to a Brazilian request, the U.S. sent a radiologist and a health physicist to Brazil to provide emergency assistance. These individuals' efforts were coordinated with those of experts sent by other nations. The U.S. team returned for a follow-up visit in the spring of 1988.

The IAEA and the Brazilian Nuclear Energy Commission (CNEN) co-hosted a post-Goiania review conference at Rio de Janeiro during July. The U.S. team and an NRC expert represented the U.S. at the conference. The accident also has been scheduled for discussion at the Special Scientific Meeting on Radiation Protection to be held in conjunction with the IAEA General Conference at Vienna in the fall of 1988.

Ongoing IAEA Activities

The U.S. actively participates in IAEA safety activities which embrace safety and radiation protection in all peaceful nuclear applications, including power, medicine, agriculture, industry and research. Representatives of the NRC, the DOE, and other agencies coordinate with the Department of State to provide U.S. input and assistance in formulation and implementation of the IAEA's ongoing safety programs.

A particularly important IAEA contribution to nuclear safety is its Operational Safety Review Team (OSART) program for civil power reactors. Through these teams, the full range of a nuclear power plant's operation is reviewed in depth over a period of several weeks. United States experts, including specialists in the fields of operations, maintenance, radiation protection, and emergency planning and preparedness, have participated in a number of these teams during FY 1988 at the request of the IAEA.

Near the end of FY 1987 fiscal year (August 10-28), the IAEA conducted a review of the operation of the Calvert Cliffs Plant in Maryland, which received overall favorable comments from the team. This visit was followed in September 1987 by an OSART visit to Laguna Verde in Mexico. During this fiscal year, there have been OSART missions to plants in the Federal Republic of Germany, Spain and Italy. Additional OSARTS are scheduled for the end of 1988 in Japan, France and Hungary. The Soviet Union also has requested an OSART mission, which the IAEA has planned for December 1988.

In addition, U.S. experts are participating in the ongoing revision of the IAEA five Nuclear Safety Codes of Practice and its 55 Nuclear Safety Standards. These codes establish the principal objectives that must be fulfilled to ensure adequate nuclear power plant safety.

International Nuclear Safety Advisory Group

The International Nuclear Safety Advisory Group (INSAG) was established in 1984 to provide guidance to the IAEA Director General on safety issues of international importance and, when possible, to formulate common safety concepts. The multinational group is chaired by Finland (A.P. Vuorinen) and includes Dr. Herbert Kouts of Brookhaven National Laboratory (DOE) from the U.S.

As part of its work, INSAG has produced useful guidance which has been published as part of the IAEA Safety Series Documents. These documents include: "IAEA Safety Series No. 75 - INSAG-1, Summary Report on the Post-Accident Review Meeting on the Chernobyl Accident" and "IAEA Safety Series No. 75 - INSAG-3, Basic Safety Principles for Nuclear Power Plants."

The INSAG mandate was to end with the completion of the basic safety principles document. However, the Board of Governors has concurred with IAEA Director General Hans Blix's recommendation that the INSAG mandate be renewed for another three years in view of its valuable work.

Nuclear Energy Agency of the OECD

The OECD Nuclear Energy Agency (NEA) serves as a technical forum in which nuclear experts from member countries meet regularly to exchange information and ideas in the field of nuclear power. It also functions to harmonize national approaches and to allow cooperation on joint projects in areas of common interest. The NEA operates through committees comprised of member states' representatives, supported by a Secretariat. The NEA Steering Committee deals with the overall concerns of the agency and is chaired by U.S. Ambassador Richard T. Kennedy. NEA Standing Committees on the Safety of Nuclear Installations and on Radiation Protection and Public Health focus on issues of nuclear safety. The Department of State, DOE and NRC are active participants in the NEA on behalf of the U.S. Government.

Examples of the NEA's function as an international forum during FY 1988 included a February "Workshop on Public Information During Nuclear Emergencies" chaired by Harold Denton of the NRC and a meeting of heads of nuclear regulatory authorities, including NRC Chairman Zech, held in June 1988 in Paris.

Another key NEA safety activity is its Incident Reporting System (IRS). Through this system, all member countries with operating nuclear power plants exchange operating experience by contributing reports of significant events which may have a safety component. The collection and dissemination of this information benefits nuclear regulatory authorities, utilities and manufacturers. The NEA coordinates its information and analyses with a similar IRS covering a broader membership and operated by the IAEA.

In June 1988 ten NEA member countries agreed to participate in a joint project to determine the extent of damage to the bottom of the Unit 2 reactor pressure vessel as a result of the 1979 accident. The three-year project, which was proposed by the U.S. NRC will provide an opportunity to develop a better understanding of nuclear accidents based upon study of an actual severe accident in an operating commercial pressurized water reactor.

Domestic Contingency Planning

During FY 1988 the interagency Federal Radiological Protection Coordinating Committee continued work on updating the Federal Radiological Emergency Response Plan (i.e., the existing federal plan for peace time emergencies). This task was begun soon after Chernobyl. Current revisions include international aspects of emergency planning as affected by the two new international nuclear safety conventions. Specific responsibilities of the Department of State are: to make any required international notifications of a radiologic incident in the U.S.; to coordinate international response activities with other U.S. agencies; and to assist in gathering information and technical data concerning radiologic emergencies which occur outside the boundaries of the U.S.

OCEAN - FISHERIES ACTIVITIES

Research Vessel Clearances

Post-cruise obligations consisting of reports, primarily data reports and research papers, are required by coastal states that granted clearances for U.S. marine scientific research (MSR) in waters under their jurisdiction. The State Department, having negotiated the clearances for such research, has the responsibility to obtain and relay appropriate reports to respective coastal states in satisfaction of obligations. During FY 1988, the Department acquired and transmitted 368 marine science reports to various coastal states as required. In order to meet total U.S. obligations, 76 reminders of overdue reports were sent to U.S. oceanographic institutions in an effort to obtain all the requisite reports.

The Department also processed 286 clearance requests to 65 foreign coastal states during FY 1988. During that same period it published 11 Notices to Research Vessel Operators which forward the marine science requirements of foreign coastal states to the U.S. marine science community.

U.S.-USSR Comprehensive Fisheries Agreement

On May 31, 1988 during the Moscow summit, Secretary Shultz and Soviet Fisheries Minister Kotlyar signed a five-year Comprehensive Fisheries Agreement to govern the U.S.-Soviet fisheries relationship. This agreement, which entered into effect on October 28, 1988 provides the U.S. fishing industry with access for the first time to Soviet waters and also governs reciprocal access by Soviet fishermen to the U.S. Exclusive Economic Zone (EEZ). In addition, the agreement provides the basis for expanded bilateral cooperation on other fisheries issues of mutual concern, including the unregulated fisheries of the central Bering Sea, the illegal harvest by third parties of salmon in the high seas areas of the North Pacific, and cooperative research on fisheries resources in the North Pacific and Bering Sea.

Scientific Symposium on Bering Sea Fisheries

Following discussions between the Department of State and Soviet authorities, the United States and the Soviet Union agreed in April 1988 to co-sponsor a multilateral scientific symposium on the effects to the Bering Sea ecosystem of the unregulated fishing in the central portion of the Bering Sea. The symposium was held in Sitka, Alaska from July 19-21 and included participants from the United States, Soviet Union, Japan, Korea, China, Poland, and Canada. The meeting was successful in providing for a full scientific review of the conservation aspects of the Bering Sea fisheries.

South Pacific Regional Fisheries Treaty

The South Pacific Regional Fisheries Treaty entered into force on June 15, 1988 with the deposit by the Department of State of the U.S. instrument of ratification with the government of Papua New Guinea in Port Moresby. Entry into force of the treaty, which had been negotiated under the leadership of the Department of State, represents clear diplomatic and scientific advances for the United States. The treaty accommodates differing and conflicting juridical positions regarding tuna and provides a pragmatic mechanism for Western and South Pacific. In addition, under the terms of the treaty, U.S. fishermen will be required to provide catch information (species, quantity and location) to the Forum Fisheries Agency, a regional body which acts as treaty

administrator. This information, combined with data obtained efforts to evaluate and monitor the health of regional tuna stocks, and will serve as a basis for any future conservation measures which may become necessary.

CCOP/SOPAC

With the Department of State playing a major leadership role, the October 1988 annual meeting of the Committee for Coordination of Joint Prospecting for Mineral Resources in South Pacific Offshore Areas (CCOP/SOPAC) in Suva, Fiji, was successful in dealing with development assistance to member countries in the areas of marine and hydrocarbon resources, conserving precious corals, coastline erosion, sea level rise, and geological mapping. The United States and Australia made funds available to complete the associated tripartite program extending this successful program for about three more years. The countries in the region appear to be pleased with the efforts taken to assist them in development of their mineral resources.

The Convention on the Regulation of Antarctica Mineral Resource Activities

Under State Department leadership, the United States and other parties to the Antarctic Treaty brought to successful conclusion six years of negotiation on an agreement to deal with possible mineral resource activities. The agreement--the Convention on the Regulation of Antarctic Mineral Resource Activities (CRAMRA)--was concluded on June 2, 1988 in Wellington, New Zealand and opened for signature on November 25, 1988. The convention establishes the necessary legal and institutional framework for determination of the acceptability of mineral resource activities in Antarctica, should interest in them emerge in the future, and for regulating any activities determined to be acceptable.

It sets forth strict environmental standards; in addition, it requires that no activity be permitted unless there is information adequate to assess its possible environmental impacts and unless an assessment of those impacts is undertaken in light of the standards. The convention provides the predictability and stability necessary for the major investments which would be required for any Antarctic mineral exploration and development meeting these standards.

The convention is designed to ensure that issues relating to mineral resources do not become a source of discord or conflict in Antarctica. Its conclusion thus represents an extension and reinforcement of the Antarctic Treaty system which has maintained Antarctica as a zone of peace, free of military activity or conflict, for the past quarter century.

OECD FRAMEWORK FOR INTERNATIONAL COOPERATION IN S&T

At the Ministerial Level meeting of the Committee for Scientific and Technological Policy (CSTP) on October 28-29, 1987, the U.S. suggested that the OECD should give high priority to identifying factors that accelerate the rate of scientific discovery, advance international openness and cooperation in the basic sciences, and encourage the diffusion and commercial exploitation of new technologies. The U.S. proposed that a statement of such factors could form the basis for an international framework which could foster international scientific cooperation and thereby strengthen the role of science and technology in accelerating worldwide economic and social growth. Following the Ministerial meeting, the CSTP

drafted guiding principles for international cooperation in S&T, in large part on proposals presented from the U.S. Office of Science and Technology Policy for open scientific communication. These principles subsequently were adopted by the Council on April 21, 1988. The General Framework of Principles for International Cooperation in Science and Technology identifies four main areas for government action in order to promote cooperation and remove barriers to S&T exchanges. These four areas are:

- support basic research;
- promote the education and training of S&T personnel and facilitate the exchange of students and scientists;
- facilitate international mobility of scientists and engineers and access to major facilities;
- promote the publication of the results of basic research in internationally available scientific literature, access to data banks, and open participation in scientific meetings.

In adopting the framework, OECD countries considered it essential to strongly restate that scientific and technological progress, and its contribution to economic growth and social development, cannot take place without the widest possible circulation of ideas and information. At the same time, they recognize that there may exist limitations to the openness of the system when it comes to the application of science and technology.

With regard to the application of scientific and technological knowledge, the framework urges member countries to promote cooperation in research programs that are oriented towards industry, encourage the circulation and trade of technologies, encourage cooperation between enterprises, and improve the protection of intellectual property rights.

POLAR PROGRAMS

The Antarctic Treaty, which grew out of the International Geophysical Year of 1957-58, is the cornerstone of the Antarctic Treaty system. It establishes the basis for international cooperation in Antarctica; reserves use of the continent solely for peaceful purposes; prohibits military activities and nuclear weapons and wastes; and guarantees freedom of scientific research on the continent. The U.S. Antarctic Program of NSF supports national goals to maintain the Antarctic Treaty, including ensuring that the continent will continue to be used for peaceful purposes to foster cooperative research in the region, to protect the environment, and ensure equitable and wise use of living and non-living resources. The number of countries party to the treaty continues to grow. During the past year Austria, Ecuador and Canada acceded to the treaty, bringing the number of treaty parties up to 38. The treaty provides for regular consultative meetings, now held biennially. The Fourteenth Consultative Meeting was held at Rio de Janeiro in October 1987. At that meeting recommendations were adopted which included provisions for greater public availability of meeting documents, the preparations of environmental impact assessments, the extension and designation of Sites of Special Scientific Interest, and improvements in the distribution of meteorological, sea ice, ocean and related data. A Special Consultative Meeting was planned for the fall of 1988 in order to consider the applications of Sweden, Spain and Peru for Antarctic Treaty Consultative Party status.

Six years of negotiations were concluded on June 2, 1988 with the establishment of the Convention on the Regulation of Antarctic Mineral Resource Activities. The convention is a well-balanced framework regime designed to govern exploitation and possible mineral development while protecting the unique environment of Antarctica. The convention will be open for signature for one year from November 25, 1988.

Another element of the treaty system is the Convention on the Conservation of Antarctic Marine Living Resources (CCAMLR). The sixth annual meeting took place at Hobart, Tasmania in October 1987 and for the first time it established seasonal area closures, regular catch reporting requirements, and overall catch limits for fish species.

A meeting of the Convention on the Conservation of Antarctic Seals is scheduled to take place at London in late 1988. Discussion of reporting requirements for the taking of seals in Antarctica is on the agenda.

The Arctic

During the past year scientists and government officials have explored the possible formation of an International Arctic Science Committee. The goal of the committee, as described by a Norwegian-Canadian proposal, primarily would be the promotion of international scientific cooperation in the Arctic. Scientists from the United States, Canada, Scandinavia and the Soviet Union have met several times to discuss the establishment of a non-governmental scientific organization during 1989.

POPULATION

The Department of State's Office of the Coordinator of Population Affairs has responsibility for coordinating U.S. international population policy that enhances the effectiveness of U.S. programs, the programs of other nations and the activities of international organizations. U.S. international population assistance programs are implemented by USAID. Cooperation between the Department and USAID is close and continuous. The primary U.S. objective is to encourage developing countries to adopt sound economic and population policies consistent with respect for human dignity and family. Population assistance is an ingredient of a comprehensive program that focuses on the root causes of development failures.

United States' policy emphasizes continued strong support for voluntary international family planning programs, the integration of population and economic development policies, the critical role a market-oriented economy can play in achieving population goals, and the prohibiting of any U.S. support for coercion or abortion in family planning programs. The implementation of this policy has resulted in a cut-off of U.S. funding of the International Planned Parenthood Federation (IPPF) and of the United Nations Population Fund (UNFPA). Funds programmed annually for UNFPA continue to be reprogrammed to other USAID supported population activities.

In FY 1988, the U.S. provided \$250 million for population assistance programs which includes \$35 million from the Africa Development Fund and \$17.5 million from the Economic Support Fund. The U.S. contribution accounts for over 40 percent of the total amount provided by developed countries. Other donors, led by Japan, have pledged to increase the level of their assistance in coming years. The developing countries provide about half, or approximately \$500 million, of the total resources allocated to population programs.

Population programs have been among the most successful examples of international cooperation. However, while the total rate of population growth has declined in recent years, there has been little reduction in fertility in a number of countries, and the absolute number of people seeking voluntary family planning services is still very great. Last year 90 million people were added to the world's population. Annual increments continue, and global population is expected to increase from today's 5.1 billion to 6.1 billion by the year 2000.

SOUTH PACIFIC REGIONAL FISHERIES TREATY

The western and southern Pacific Ocean became an important fishing area for the U.S. tuna fleet in the early 1980s. Despite the wide expanse of ocean, most waters fall within the 200 mile exclusive economic zones of the island nations of the region.

The Pacific Island states, along with most other coastal states, claim jurisdiction over all economic resources out to 200 nautical miles from their coast. In contrast, the U.S. neither claims nor recognizes coastal state jurisdiction over tuna beyond 12 nautical miles from the coast, contending that their unpredictable nomadic movements require cooperative international management and conservation regimes rather than unilateral coastal state jurisdiction.

These jurisdictional disputes over tuna resulted in seizures of U.S. tuna boats by Pacific Island states for unlicensed fishing in their exclusive economic zones in violation of their national laws. These seizures precipitated retaliatory embargoes on tuna from the seizing nations, as mandated by the Magnuson Fishery Conservation and Management Act, and led to a pronounced deterioration in U.S. relations with the island governments of the South Pacific.

To resolve these problems, and secure agreed terms of access for the U.S. tuna fleet, the U.S. initiated negotiation of a regional commercial licensing arrangement with fourteen Pacific Island states, Australia and New Zealand in September, 1984. Nations participating in the negotiations were Australia, Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, New Zealand, Niue, Palau, Papua New Guinea, Solomon Islands, Tonga, Tuvalu, Vanuatu and Western Samoa. Ten negotiating sessions over two years led to agreement in principle on a regional fisheries treaty in October 1986.

The agreement sets forth the terms and conditions for U.S. flag tuna boats to purchase regional licenses to fish in some 10 million square miles of the western and southern Pacific Ocean (Fig. 1). Up to 50 licenses per year will be made available; in the first year up to 40 will be made available at \$50,000 each and 10 additional licenses may be purchased at \$60,000 each. In subsequent years, license prices will be indexed to the price of tuna, but will not drop below \$50,000 each. The U.S. tuna industry has guaranteed a lump sum payment of \$1.75 million for 35 licenses in the first year of the treaty. In addition, it has agreed to provide technical assistance in fisheries valued at \$250,000 annually for five years.

Associated with the treaty is an economic assistance agreement under which the U. S. will provide the island states party to the treaty \$10 million annually for five years. This two-tiered approach to fishing access was developed in response

to increased overtures by the Soviet Union for fishing agreements in the area. (The Soviet Union concluded one year agreements with Kiribati in November 1985, and Vanuatu in January 1987.) This led the island states to propose licensing fees unrelated to the economics of the tuna fishery. Conclusion of the treaty without the assistance agreement would have been impossible due to the willingness of the Soviet Union to pay disproportionately higher licensing fees and due to the deteriorating U.S. relations in the region as the result of conflicting juridical positions on tuna.

The treaty was signed at Port Moresby, Papua New Guinea on April 2, 1987 by the U.S., Australia, Cook Islands, Federated States of Micronesia, Fiji, Kiribati, Marshall Islands, Nauru, New Zealand, Papua New Guinea, Solomon Islands, Tuvalu and Western Samoa. Niue, Palau and Vanuatu subsequently signed the treaty later in 1987, and it is hoped that Tonga will sign in the near future.

To enter into force, the treaty must be ratified by the U.S., Federated States of Micronesia, Kiribati, Papua New Guinea, and seven additional Pacific Island states.

The U.S. Senate gave its advice and consent to ratification by a vote of 89 - 0 on November 6, 1987, and President Reagan ratified the treaty on December 21. Implementing legislation was enacted by the Congress and signed into law by the President on June 7, 1988; the U.S. instrument of ratification was deposited with the Government of Papua New Guinea on June 15, 1988. This brought the treaty into force, as the requisite Pacific Island states had already deposited their instruments of ratification.

Entry into force of the treaty represents clear diplomatic and scientific advances for the U.S.. The treaty accommodates differing and conflicting juridical positions on tuna and provides a pragmatic mechanism for U.S. fishermen to obtain access to this resource. In addition, under the terms of the treaty, U.S. fishermen will be required to provide catch information (e.g., species, quantity and location) to the Forum Fisheries Agency, a regional body which acts as treaty administrator. This information, combined with data obtained from other nations fishing in the region, is essential to efforts to evaluate and monitor the health of regional tuna stocks, and will serve as a basis for any future conservation measures which may become necessary.

SPACE STATION

In 1988, the U.S. completed negotiations on cooperation with Europe, Japan and Canada in building and operating the permanently manned Space Station. These negotiations began three years ago pursuant to President Reagan's 1984 invitation to friends and allies to join in this bold endeavor.

The agreements reached consist of: (1) a multilateral intergovernmental agreement to be signed by the U.S., Canada, Japan and nine members of the European Space Agency (Belgium, Denmark, France, the Federal Republic of Germany, Italy, the Netherlands, Norway, Spain and the United Kingdom); and (2) three memoranda of understanding (MOUs) between NASA and its European, Japanese and Canadian counterparts. The agreements govern cooperation among the partners throughout the life of the Space Station program, which is expected to last several decades.

The level of international cooperation involved in this project is, in many respects, unprecedented. Europe, Japan and Canada will contribute laboratory modules and other hardware, valued at more than \$7 billion, to the Space Station. (The initial U.S. investment in the Space Station is expected to total \$16 billion.) Each partner will be allocated a proportion of the Space Station's physical space and resources roughly commensurate with its investment. Each partner also will provide crew members, participate in managing the Space Station, and share operational costs.

Successful cooperation will be a durable and highly visible symbol of the determination of the U.S. and its friends to work together for mutual benefit. It also lays the groundwork for significant additional cooperation among the Western allies in the next century in expanding the human presence beyond the near-Earth orbit.

WORLD OCEANS

World Ocean Circulation Experiment (WOCE) and Climate

It is recognized that ocean phenomena and their interactions with atmospheric phenomena affect both the adjacent and distant ocean and atmosphere, as well as land areas near and far. Since the results often include droughts and other forms of severe weather from the sea to far inland, and hence much of humankind's daily and long-term activities, increasing attention is being devoted to both the how and the why of these interactions, and with increasing technological capabilities (e.g., satellites, computers and improved electronic communications networks) this is being addressed on a global scale. Intensive planning has been taking place on various aspects of the problem, and some research efforts have been initiated. One significant aspect on which planning is still underway is modeling and predicting the circulation of the ocean and its role in climate change. If the climate goals are reached, great progress also will have been made in understanding ocean circulation as it affects such disciplines as biogeochemistry, sedimentology, waste disposal and biomass-resource management.

During FY 1988, a U.S. Implementation Plan for the World Ocean Circulation Experiment (WOCE) was completed. WOCE and the Tropical Ocean and Global Atmosphere (TOGA) study are the two ocean-related aspects of the World Climate Research Programme (WCRP). Without attempting to be all-inclusive, the U.S. plan addresses the bilateral and multilateral ocean research programs involving the U.S. and other nations in WOCE research. The U.S. plan will be submitted to the WOCE International Scientific Conference at Paris in November 1988. Following final review and revision, implementation of the 10-year WOCE plan is expected to commence in 1990. A longer-term goal of WOCE is to determine the representativeness of the specific WOCE data sets for the long-term behavior of the ocean, and to find methods for determining long-term changes in ocean circulation. This aspect may be expected to continue well into the next century.

GLOBEC International Activities and Prospects

GLOBEC (Global Ocean Ecosystem Dynamics) is a developing program within NSF's overall Global Geoscience initiative. It addresses a basic concern for the causes of variability in marine ecosystems with the ultimate goal of understanding the effects of physical processes on marine populations well enough to predict long-term changes in population abundance. GLOBEC is closely related to a number of ongoing international

research programs and planning activities. In June 1987, NATO sponsored an Advanced Research Workshop on "Biodynamics in the Sea". The International Council for the Exploration of the Sea (ICES) has established a larval fish ecology working group. The Intergovernmental Oceanographic Commission (IOC) and the Food and Agricultural Organization of the U.N. (FAO) have established a joint Ocean Sciences in Relation to Living Resources (OSLR) program with a major component called the International Recruitment Program (IREP) which already has initiated a project entitled the Sardine/Anchovy Recruitment Project (SARP). The Northwest Atlantic Fishery Science Organization also has established a scientific council while both France and Japan have announced similar national planning activities.

In May 1988 near Charlottesville, Virginia the Joint Oceanographic Institutions convened a major community workshop to define the scientific issues in GLOBEC. More than a hundred research scientists and science agency representatives attended. Participants came from the U.S., Canada, France and the U.K. In the wake of that workshop, a number of international activities have been initiated. Plans have been made to form a SCOR working group on physical processes affecting biologic variability. The proposed terms of reference for this group include assisting in planning cooperative programs at the international level and holding appropriate workshops yielding by 1991 a report on strategies for international cooperation in the critical research area. At the ICES meeting in the fall of 1988, a subgroup of experts will discuss GLOBEC technical requirements. Special sessions on GLOBEC already have been scheduled for the winter meetings of AGU/ASLO at San Francisco. It currently is planned that session conveners and participants will include scientists from both Canada and the U.K. in addition to their counterparts in the U.S.

Joint Global Ocean Flux Study (JGOFS)

The main goal of the internationally coordinated decade-long Joint Global Ocean Flux Study (JGOFS) is to determine and understand on a global scale the processes controlling the time-varying fluxes of carbon and associated biogenic elements in the ocean, and to evaluate the related exchanges with the atmosphere, sea floor and continental boundaries. JGOFS is based upon a premise that the biogeochemical cycling of carbon and other biologically important elements plays a major role in controlling the global environment. Processes in the ocean are fundamental to this cycling. For example, the oceans constitute a major global reservoir of carbon. Thus, an understanding of the processes governing the production, fate and cycling of biogenic materials in the sea is critical to any program related to studies of global environmental changes, including longer-term climatic changes.

JGOFS grew out of similar national flux studies in the U.S., U.K., France, FRG and Japan. The program is planned to interact with several global geoscience and other major oceanographic programs, including the World Ocean Circulation Experiment (WOCE), the Tropical Ocean and Global Atmosphere (TOGA) study, the Global Tropospheric Chemistry Programme, the International Geosphere-Biosphere Programme (IGBP), the Global Investigation of Pollution in the Marine Environment (GIPME), and the ocean aspects (CCCO) of the World Climate Research Programme (WCRP).

With the national GOFs efforts already underway, a planning session was held at Plymouth, England in April 1988 for the

first fully international effort under JGOFS. This will concentrate in the North Atlantic with extensions into the Arctic Ocean. The participants will include the U.K., FRG, Canada and the U.S., with U.S. GOFS efforts also underway in the Pacific.

Intergovernmental Oceanographic Commission (IOC)

The IOC is the only intergovernmental body for coordinating oceanographic programs on a global scale. Maintaining U.S. membership provides a unique mechanism for promoting U.S. interests in a number of high-priority areas. These include:

(1) Global Climate Research - The IOC is responsible for coordinating a number of climate-specific programs essential for the collection of oceanographic data to support current and planned global climate research programs. These activities directly benefit U.S. interests as defined by Congress in the Global Climate Protection Act of 1987.

(2) Oceanographic Data Exchange - Cost savings derived by the U.S. through this IOC program are estimated at \$3.57 billion (archive replacement value) for bathymetric and oceanographic data. For 1985 alone, the value was \$116 million. Most Soviet and Eastern Bloc data are not available except through this mechanism.

(3) Tsunami Warning System - This system monitors earthquakes in the Pacific and warns of resulting tsunami travel time and impact. U.S. interests in the Pacific and coastal states benefit directly. In addition, support through the IOC for the International Tsunami Information Center at Honolulu is \$5.25 million annually.

(4) Bathymetric Charting - A project of particular interest to the U.S. is the International Bathymetric Chart of the Caribbean, the first phase of a longer-term project for geological and geophysical mapping of the region. The U.S. will acquire new, higher quality charts of its own economic zone, as well as others, at a fraction of the cost of a U.S. effort.

(5) Global Sea-Level Observing System - A new global network of 250 sea-level monitoring stations is being implemented to provide data essential for climate research, and for calibration and validation of U.S. Navy and NOAA satellite ocean observing systems scheduled for launching in the early 1990s.

(6) Marine Pollution Research and Monitoring - The global assessment of oceanic contaminants and the biologic effects of pollution are expected to provide a scientific basis for regulatory action under various international conventions. The IOC works closely in this program area with the U.N. Environment Program (UNEP).

(7) Global Ocean Services - The IOC coordinates a global system of real-time marine meteorologic and oceanographic observations used by the U.S. forecasters for medium and long-range forecasts, and by U.S. shipping and maritime interests to promote safety at sea. They also are vital for climate research.

Research Vessel Clearances

The total number of U.S. clearance requests for Marine scientific research made to foreign coastal states continued to

climb during 1987 (288 total requests). A negative aspect that has emerged is the growing number of requests that must be cancelled or are otherwise disrupted owing to denials or late or non-responses by coastal states. Prior to 1986, the percentage of denials or other disruptions always had been less than 10 percent. There was a rise to 12 percent in 1986 and to 16 percent in 1987. This trend may be related to problems associated with the transition to the new regime for marine scientific research contained in the U.N. Convention on the Law of the Sea (UNCLOS). The U.S. is working for agreed and predictable ways of implementing the marine scientific research provisions of UNCLOS.

World Ocean Agreement

The 1973 U.S.-Soviet Agreement on Cooperation in Studies of the World Ocean was extended for a year until December 1988 when Soviet Foreign Minister Shevardnadze handed a diplomatic note to Secretary of State Shultz. The more or less dormant agreement, which would have expired in a few days, was extended to allow Soviet and American scientists and officials time to explore the possibility of reviving cooperative activity.

Discussions with the Soviets on possible new activities under the agreement were held on March 2-3, 1988 at Washington. The group agreed that:

- (1) there are significant areas of mutual interest;
- (2) proposals should be prepared for three specific projects--Southern Ocean Dynamics, Mid-Atlantic Ridge Crest Processes, and Geochemistry of Bottom Sediments in the Northern Pacific; and
- (3) the U.S.-USSR Joint Committee on Cooperation in World Ocean Studies should be scheduled to meet in the near future to implement the projects.

No projects will be implemented until a new agreement is negotiated, which is expected in early 1989.

APPENDIX I

DATABASE I

SUMMARY OF U.S. INTERNATIONAL

S&T AGREEMENTS

BY U.S. AGENCY



Explanation of Database and Footnotes

The information in the following database is intended to provide an overview of international cooperative activities in science and technology between government agencies of the United States and their counterpart agencies in other countries. For the most part, the items listed in the database are at the Memorandum of Understanding (MOU) level or higher; information also is provided on some large project agreements and contractual arrangements.

COUNTRY designates the cooperating foreign nation. "Multilateral" and "Regional" are used for agreements signed with more than one country that are essentially identical agreements in a single area of cooperation.

AGENCY generally designates the United States agency that is the lead agency for the agreement.

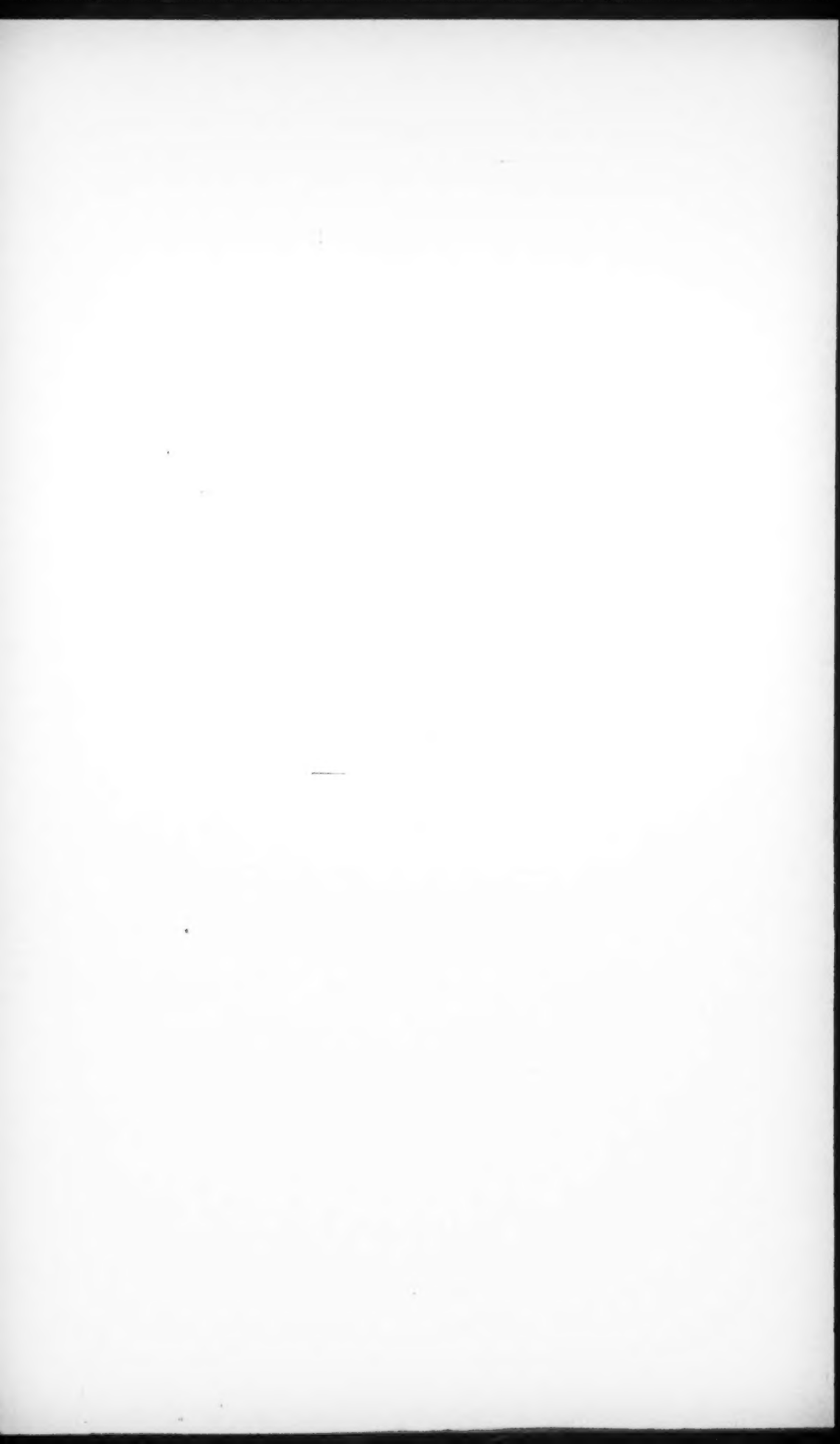
SUBJECT AREA designates the broad area of cooperation.

ENTRY INTO FORCE (Y/M) and TERMINATION DATE (Y/M) indicates the duration of the agreement. Agreements that have been renewed without significant changes frequently show the initial date of entry into force. "Indef" generally indicates an agreement with an indeterminate duration; it may extend until the cooperative activities are completed or until funds are depleted, or it may be an agreement that renews automatically unless terminated by mutual written consent. "Variable" is used for regional agreements, indicating that some of the agreements were initiated and terminated on different dates.

FUNDING lists FY 1988 agency funding when it is available. The figures are presented in thousands of U.S. dollars. Footnotes apply to funding information. The following footnotes are utilized:

- cr = cost reimbursable cooperation;
- nb = no specific budget item;
- rak = see REMARKS column for funding information;
- sic = funding provided from special foreign currency account.

REMARKS provides specific details on cooperative activities, funding information, and other information.



AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Army/COE	China	Natural Resources	86/05	91/04	225	Protocol between Army and Ministry of Water Resources and Electric Power on water resources & related areas under umbrella agreement; annexes provide for specific research on improved navigation project design; other navigation-related research with the Ministry of Communications
Army/COE	USSR	Building Technology	87/04	92/04		Participation under the direction of the Dept. of Defense in the U.S.-USSR Joint Committee on housing in the field of housing and other construction
BReclam	Brazil	Natural Resources	86/11	89/11		Land & water resources institution building; advisory assistance to Ministry of Irrigation on expanding irrigated agriculture in northern Brazil; World Bank funding of \$1.2 million
BReclam	China	Natural Resources	84/08	88/12		Multipurpose dam development; advisory assistance in design, construction & related aspects of a high dam on the Yangtze River gorge; advisory assistance on roller-compacted dam design and construction PRC funding of \$300,000

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
BReclam	Egypt	Energy	82/09	92/05		Hydro-power & electrical systems rehabilitation; advisory assistance on turbine-runner replacement & rehabilitation of electrical generating equipment at the Aswan High Dam; funding by USAID of \$1.35 million.
BReclam	Egypt	Natural Resources	87/03	91/07		Development of computer models for the Nile River & various canals; funding by USAID of \$60,000
BReclam	India	Natural Resources	87/06	90/06		Training in dam safety and instrumentation of dams; UNDP funding of \$100,000
BReclam	Indonesia	Natural Resources	87/06	89/06		Dam safety evaluation of existing structures; training in dam safety inspection; funding by Indonesia of \$250,000
BReclam	Israel	Natural Resources	84/05	89/05		S&T exchange program in water resources; joint funding
BReclam	Israel	Natural Resources	84/05	89/05		Technical assistance in water resources development
BReclam	Italy	Natural Resources	86/10	91/10	98	Technical cooperation in dam safety engineering; joint funding

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
BReclam	Malaysia	Natural Resources	88/01	Indef		Technical assistance during initial filling of Batu Dam for water conservation & flood control; funding by Malaysia of \$137,000
BReclam	Morocco	Natural Resources	84/05	89/12		Development assistance in weather modification programs to increase natural water supplies; funding by USAID of \$1.0 million
BReclam	Pakistan	Natural Resources	84/04	89/04		Technical assistance in the design & construction of irrigation drainage systems; reclamation of saline & waterlogged agricultural lands; funding by the World Bank of \$1.8 million
BReclam	Saudi Arabia	Natural Resources	79/11	90/02		Technical assistance in the development of land & water resources; desalinization application & research; institution building; funding by Saudi Arabia of \$402,000

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
BReclam	Spain	Natural Resources	84/10	89/10		Information exchanges & joint research; river basin modeling; irrigation design & operation; funding by Spain of \$50,000
BReclam	Thailand	Natural Resources	88/04	90/07		Development assistance in weather modification programs to increase natural water supplies; funding by USAID of \$250,000
BReclam	Zaire	Energy	84/07	88/03		Electric power; advisory assistance in operation of extra-high voltage DC transmission lines; training; institution building; funding by Zaire of \$50,000
Census	Canada	Statistics	86/03	91/03	none	This MOU recognizes long-standing informal cooperation and provides for its continuation, specifically including exchange visits, joint study and research and, in an important annex, a joint project to reconcile trade statistics which also includes the customs organizations of the two governments

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Census	China	Statistics	84/07	89/07	none	This protocol provides for cooperation and exchange in the field of statistics. Annexes cover exchange of statistical information, exchange of technical-professional delegations, university statistical training, and applied statistical training
Census	Mexico	Statistics	86/03	91/03	none	This cooperation agreement provides for the exchange of methodologies, documents, information, and training and the development and execution of joint statistical projects
DOC	France	Technology Commerce	86/02	91/02		Through Office of Productivity, Technology & Innovation, Economic Affairs. Modeled after Israel BIRD and India PACT agreements. Seven joint ventures concluded in 1988
DOC	India	Technology Commerce	85/08	90/08	AID	Through Office of Productivity, Technology and Innovation, Economic Affairs. Modeled on the Israel BIRD Foundation. 12 joint ventures concluded in 1988

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
DOE	Australia	Energy (Renewable)	88/06	98/04		Exchange of information on alternate fuels, particularly transport fuels
DOE	Belgium	Energy (Rad.Waste)	81/01	89/01		Exchange of technology in radioactive waste management to include geological storage technology and waste processing technology
DOE	Brazil	Energy (fossil)	84/05	99/00		Analysis of feasibility of exploitation of Brazilian coal
DOE	Canada	Energy	86/12	96/12		General bilateral agreement for the purpose of establishing wider cooperation in the field of energy research & development
DOE	Canada	Energy (Fossil)	88/02	98/02		Establish a framework for collaboration in the field of natural gas hydrates
DOE	Canada	Energy (Fossil)	79/06	89/12		Cooperation in R&D activities having to do with tar sands & heavy oil extraction, processing & related technologies
DOE	Canada	Energy (Fusion)	87/11	92/11		Finding solutions to mutually agreed upon problems associated with the development of magnetic fusion as a source of energy

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
DOE	Canada	Energy (Nuclear)	82/08	92/08		Cooperation in various phases of radioactive waste management storage & processing technology
DOE	China	Energy	79/01	89/01		Cooperation in high energy physics to include theoretical & experimental research, accelerator design & construction techniques
DOE	China	Energy (Fusion)	83/05	88/05		Cooperation in promoting each other's program in nuclear physics & controlled magnetic fusion
DOE	China	Energy (Fossil)	85/04	90/04		Cooperation in fossil energy R&D with emphasis on atmospheric & pressurized fluid bed combustion; surface coal gasification; coal liquifaction & enhanced oil recovery
DOE	Finland	Energy	80/11	90/11		General bilateral agreement for the purpose of establishing wider cooperation in the field of energy research & development

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
DOE	France	Energy (Fossil)	88/02	91/02		Establish a balanced exchange of R&D information on enhanced oil recovery techniques
DOE	France	Energy (Nuclear)	85/05	90/05		Cooperate on R&D to improve national nuclear material accounting and control techniques
DOE	France	Energy (Nuclear)	77/01	87/12		Exchange of technology of liquid metal fast breeder reactors
DOE	France	Energy (Nuclear)	86/06	91/06		Exchange and sharing of nuclear criticality data
DOE	France	Energy (Nuclear)	85/09	90/09		Cooperation in the field of remote systems technology
DOE	France	Energy (Nuclear)	83/07	93/07		Cooperation in all phases of radioactive waste management
DOE	France	Energy (Nuclear)	83/04	93/04		Cooperation on research, development, test & evaluation to improve physical protection of nuclear materials & facilities
DOE	Germany, Fed Rep	Energy (Nuclear)	84/11	90/11		Immobilization processes for high level radioactive waste
DOE	Germany, Fed Rep	Energy (Nuclear)	77/09	99/09		R&D to improve nuclear material safeguards & physical security

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AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
DOE	Germany, Fed Rep	Energy (Nuclear)	74/12	89/12		Cooperation in radioactive waste management regarding the disposal of separated waste products & disposal of spent fuel
DOE	Germany, Fed Rep	Energy (Nuclear)	76/06	87/12		Cooperation in the design, development, construction & operation of liquid metal fast breeder reactors. Being renegotiated to include France, UK, Italy and Belgium)
DOE	Germany, Fed Rep	Energy (Nuclear)	77/02	92/02		Cooperation in the development of high temperature gas cooled reactors
DOE	India	India	87/08	92/08		Cooperation on R&D activities pertaining to enhanced oil recovery, underground coal gasification and related technologies
DOE	Israel	Energy	84/06	89/06		General bilateral agreement for the purpose of establishing wider cooperation in the field of energy research & development
DOE	Israel	Energy (Physics)	87/05	92/05		Cooperation in high energy physics, applied mathematical sciences, and other basic energy sciences
DOE	Israel	Energy (Renewable)	85/06	90/06		Cooperative studies and biomass R&D

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
DOE	Israel	Energy (Renewable)	87/11	89/11		Cooperation in the use of metal hydride slurries in heat pumps
DOE	Israel	Energy (Renewable)	87/11	89/11		Cooperation in use of ceramic receivers and thermochemical conversion of hydrocarbons for distributed and central receivers
DOE	Israel	Energy (Renewable)	85/06	90/06		Cooperation to advance understanding of absorption cycles & working fluids for solar cooling
DOE	Israel	Energy (Renewable)	85/06	90/06		Cooperative work in low cost solar cells, absorption heat pump studies & research in amorphous silicon films
DOE	Italy	Energy	85/12	90/12		General bilateral agreement for the purpose of establishing wider cooperation in the field of energy research & development
DOE	Italy	Energy (Renewable)	75/06	90/06		Collaboration in geothermal R&D to include hot dry rock, brine utilization & deep drilling methods
DOE	Japan	Energy	79/05	89/05		General bilateral agreement for the purpose of establishing wider cooperation in the field of energy research & development

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
DOE	Japan	Energy	79/11	89/05		Cooperation in high energy physics including research, accelerator & detector instrumentation R&D & the fabrication & subsequent use of new experimental devices & facilities
DOE	Japan	Energy	84/04	89/04		Research on the effects of electrical fields associated with high voltage transmission lines on primates
DOE	Japan	Energy (Fossil)	87/05	89/05		Comprehensive cooperation in various phases of coal technology development
DOE	Japan	Energy (Fusion)	83/01	89/05		Cooperative exchange of information, personnel & equipment, & special activities as may be agreed with various ministries, as established by exchange of diplomatic notes & separate agreements with each ministry
DOE	Japan	Energy (Fusion)	79/08	88/08		Undertake experimental research on tokamak plasmas in the Doublet III, a tokamak facility

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
						research in biomass systems
DOE	Japan	Energy (Fusion)	79/08	92/08		Establish a coordinating committee to facilitate the implementation of cooperative activities in fusion research
DOE	Japan	Energy (Nuclear)	85/09	90/09		Cooperation in the development of high temperature gas cooled reactor technology
DOE	Japan	Energy (Nuclear)	84/04	85/05		Evaluate the impact of the TMI accident, emergency countermeasures & reactor behavior; develop industrial technologies with respect to decontamination & waste treatment
DOE	Japan	Energy (Nuclear)	86/12	96/12		Cooperatively develop technology for safe management of radioactive waste
DOE	Japan	Energy (Nuclear)	88/03	92/03		Cooperate in improving effectiveness of techniques to implement nuclear safeguards
DOE	Japan	Energy (Nuclear)	79/01	89/01		Cooperation in the design, development, construction & operation of liquid metal fast breeder reactors

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
DOE	Japan	Energy (Renewable)	81/09	89/05		Cooperation in research in solar energy conversion by means of photosynthesis
DOE	Japan	Energy (Renewable)	78/06	88/06		Establish a balanced exchange of geothermal energy application technology
DOE	Japan	Energy (Renewable)	82/05	89/05		Establish a balanced exchange of solar technology in solar thermal power systems, photovoltaic power systems & solar heating & cooling
DOE	Korea	Energy (Fossil)	81/11	91/10		Exchange of coal related information; personnel exchange & consultation in coal technology
DOE	Korea	Energy (Renewable)	81/11	91/11		Cooperation in all phases of solar energy research
DOE	Korea	Energy (Renewable)	81/11	91/11		Cooperation in the broad area of energy conservation
DOE	Mexico	Energy (Fossil)	83/06	89/06		Exchange information & develop basic & applied research programs in petroleum technology
DOE	Mexico	Energy (Renewable)	86/04	89/04		Develop an understanding of geothermal reservoirs in sedimentary & fractured igneous rocks

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
DOE	Multilateral (EC)	Energy	86/07	91/07		Cooperation in research & development related to radiation protection
DOE	Multilateral (EC)	Energy (Fusion)	86/12	96/12		Cooperation with EURATOM to develop scientific & technological understanding of a magnetic fusion power system
DOE	Multilateral (EC)	Energy (Nuclear)	82/10	92/10		Exchange of information on the management of radioactive waste, i.e., characterization of waste forms & disposal in geologic formations
DOE	Multilateral (EC)	Energy (Renewable)	82/12	99/12		Exchange of information on thermal solar power stations, photovoltaic energy production & energy production from biomass
DOE	Norway	Energy (Fossil)	87/03	91/03		Exchange information & conduct joint fossil energy research projects
DOE	Saudi Arabia	Energy (renewable)	87/02	92/02		Finding solutions to mutually agreed on problems in renewable energy research & development
DOE	Spain	Energy	85/12	99/12		Joint evaluation & funding of proposals & projects in the field of energy

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
DOE	Spain	Energy	86/10	99/10		Provide funding for study of electron-positron collision interactions
DOE	Spain	Energy (Fossil)	86/06	91/06		Cooperate in R&D pertaining to coal gasification technologies
DOE	Spain	Energy (Fusion)	85/12	88/12		Cooperation in toroidal confinement devices
DOE	Spain	Energy (Nuclear)	85/12	88/12		Cooperation in probabilistic risk assessment for light water reactors
DOE	Sweden	Energy (Nuclear)	80/09	90/12		Exchange information in radioactive waste management, particularly in the assessment of rock formations for terminal storage
DOE	Switzerland	Energy (Nuclear)	85/04	90/04		Study of mutually agreed topics associated with the management of nuclear waste & related activities of the nuclear fuel cycle
DOE	Switzerland	Energy (Nuclear)	82/11	90/11		Irradiation of fuel pellets in the DOE Fast Flux Test Facility
DOE	USSR	Energy (Fusion)	83/06	89/06		General cooperation in high energy physics
DOE	USSR	Energy (Fusion)	83/06	89/06		Cooperation in various phases of fusion research

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
DOE	USSR	Engery (Nuclear)	83/06	88/06		Exchange of information, personnel & equipment in the field of peaceful uses of nuclear energy
DOE	United Kingdom	Energy (Fossil)	84/10	89/10		Exchange of information with the UK National Coal Board
DOE	United Kingdom	Energy (Nuclear)	86/10	91/10		Exchange of technology for management of radioactive waste
DOE	United Kingdom	Energy (Nuclear)	85/03	89/03		Exchange of technology & experience in decommissioning nuclear facilities
DOE	United Kingdom	Energy (Nuclear)	76/09	87/12		A balanced exchange of liquid metal fast breeder reactor technology in such areas as reactor safety, neutronics analysis, etc., being renegotiated to include FRG, France, Italy and Belgium
DOE	Venezuela	Energy	80/06	88/06		General bilateral agreement for the purpose of establishing wider cooperation in the field of energy research & development

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
DOE	Venezuela	Energy	Varied			Under the umbrella research and development agreement with Venezuela, the DOE has executed eight project agreements in the areas of enhanced oil recovery, coal technology and geochemistry
DOE	Venezuela	Energy (Renewable)	88/02	90/02		Cooperate in energy R&D in the area of energy conservation
DOT	Australia	Transportation	68/10	90/10	nb	Projects and technical exchanges carried out under the US-Australia S&T Agreement. Interests are primarily aviation, urban innovations, and highway/traffic safety
DOT	Brazil	Transportation	84/03	Indef	nb	Identified areas for cooperation: civil aviation; urban mass transit; vehicle fuel conservation & alternative fuel technology
DOT	Canada	Transportation	70/06	Indef	nb	Urban systems; rail research; Marine transport research; aeronautics; traffic & vehicle safety; highway research; systems for disabled; and R&D on broad aspects of transport systems

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
DOT	China	Transportation	83/05	88/05	nb	Annex I to Protocol between DOT & MOC: cooperation between DOT/FHWA and Bureau of Highways in all areas of highway transportation
DOT	China	Transportation	83/05	88/05	nb	Protocol with the Ministry of Communications (MOC) under the umbrella S&T agreement; urban systems; transport research planning; highway construction & safety; civil aviation technical assistance
DOT	China	Transportation	86/12	91/12	nb	Protocol between DOT/FRA & Ministry of Railways under the umbrella S&T agreement; covers all areas of rail transportation
DOT	China	Transportation	87/01	Indef	nb	Agreement between DOT/USCG & the Bureau of Harbor Superintendency; covers all areas of search & rescue cooperation
DOT	China	Transportation	87/05	88/05	nb	Annex II to Protocol between DOT & MOC: Cooperation between DOT, DOD Corps of Engineers and PRC Bu of S&T in part engineering & waterborne transport
DOT	Finland	Transportation	81/07	Indef	nb	Icebreaking technology

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
DOT	France	Transportation	72/02	Indef	nb	Exchanges on automated guideway transit assessment; project agreements on urban & rail technology and operations
DOT	Germany, Fed Rep	Transportation	79/07	Indef	nb	Agreement with Ministry of Transport (3/75) & a related agreement with the Ministry of Research & Technology (7/78); automated guideway transit assessment; freight demand forecasting; travel behavior research; transit bus tech- nology; highway engineering & operation
DOT	Hungary	Transportation	78/10	Indef	nb	Three formal project agreements covering rail track stability, design/construction of steel & concrete bridges, computer techniques in roadway & bridge design; exchanges on road/rail crossings safety; and exchange of research abstracts
DOT	Indonesia	Transportation	88/07	Indef	nb	USCG-GOI Agreement on Maritime Search & Rescue
DOT	Italy	Transportation	72/02	Indef	nb	Transport system safety

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
DOT	Japan	Transportation	69/07	Indef	nb	US-Japan Transportation Research Panel established through the Joint Economic & Trade Committee; urban systems; traffic management; high speed rail, including magnetic levitation; aviation R&D; environment control strategies
DOT	Mexico	Transportation	72/11	Indef	nb	Highway; rail; maritime search & rescue; oil pollution control; joint border transport planning
DOT	Micronesia	Transportation	88/06	Indef	nb	USCG-Micronesia Foreign Affairs Ministry Agreement on Maritime Search and Rescue
DOT	Multilateral	Transportation	Ongoing	Ongoing	nb	International Road Federation; highway projects and technical data base coordination
DOT	Multilateral	Transportation	Ongoing	Ongoing	nb	United Nations International Atomic Energy Agency (IAEA); Standing Advisory Group on Safe Transport of Radioactive Material

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
DOT	Multilateral	Transportation	Ongoing	Ongoing	nb	Organization for Economic Cooperation & Development (OECD); DOT represented on Road Transport Research Program Steering Committee and active in selected research studies
DOT	Multilateral	Transportation	Ongoing	Ongoing	nb	Permanent International Association of Navigational Congresses (PIANC)
DOT	Multilateral	Transportation	Ongoing	Ongoing	nb	Pan American Railway Congress Association (PARCA)
DOT	Multilateral	Transportation	Ongoing	Ongoing	nb	Maritime - special groups: Int Assoc of Lighthouse Authorities; Int Working Group on LORAN C; Int Ship Structures Cong; Int Radio Consultative Comm; Panama Canal Seminar on Tonnage System Changes; Seminars on Marine Pollution & Chemical Tankers & Gas; Int Symp on Remote Sensing of the Environment; Venezuela Air Safety Cong; Search & Rescue Satellite-Aided Tracking Demonstration Proj; UNEP Monitoring Comm on the Action Plan for the Caribbean Environment Program

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
DOT	Multilateral	Transportation	Ongoing	Ongoing	nb	United Nations International Telecommunications Union (ITU): World Administrative Radio Conference for Mobile Services
DOT	Multilateral	Transportation	Ongoing	Ongoing	nb	International Organization for Standardization (ISO); transport vehicle hardware standardization
DOT	Multilateral	Transportation	Ongoing	Ongoing	nb	United Nations Economic Commission for Europe (ECE); Inland Transport Committee Groups of Experts on Construction of Vehicles (WP 29) & Road Safety (GE 20); Combined Transport (GE 24); Transport of Dangerous Goods (GE 15); Committee on Development of Trade: Facilitation (WP 4)
DOT	Multilateral	Transportation	Ongoing	Ongoing	nb	United Nations Economic & Social Council: Committee of Experts on Transport of Dangerous Goods
DOT	Multilateral	Transportation	Ongoing	Ongoing	nb	Pan American Highway Congress: various technical and policy programs for coordination in the Americas

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
DOT	Multilateral	Transportation	Ongoing	Ongoing	nb	European Conference of Ministers of Transport (ECMT); various technical subjects; high-level policy discussions in Council Sessions
DOT	Multilateral	Transportation	70/01	Indef	nb	EUROCONTROL Group: Civil Aviation; management information exchanges on air navigation
DOT	Multilateral	Transportation	Ongoing	Ongoing	nb	International Union of Railways (UIC); information exchanges; committee projects on rail research; annual membership dues of \$40,000
DOT	Multilateral	Transportation	Ongoing	Ongoing	nb	Experimental Safety Vehicle Program: Separate agreements for cooperation with the FRG, France, Italy, Japan, Sweden and the UK, established under auspices of NATO Committee on the Challenges of Modern Society
DOT	Multilateral	Transportation	Ongoing	Ongoing	nb	Permanent International Association of Road Congresses (PIARC)
DOT	Multilateral	Transportation	Ongoing	Ongoing	nb	Organization of American States (OAS): Inter-American Port & Harbor Conferences

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
DOT	Multilateral	Transportation	Ongoing	Ongoing	nb	United Nations Economic & Social Commission for Asia & the Pacific (ESCAP)
DOT	Multilateral	Transportation	Ongoing	Ongoing	nb	United Nations International Maritime Organization (IMO); annual Assembly; Council; Committees on Maritime Safety, Marine Environment Protection Legal, Facilitation, & Technical Cooperation
DOT	Multilateral	Transportation	Ongoing	Ongoing	nb	United Nations International Civil Aviation Organization (ICAO); annual Assembly Meetings; 9 Regional Groups; 3 special committees; 13 Panels which have established various ad hoc study groups
DOT	Netherlands	Transportation	09/77	Indef	nb	Transportation economics studies; highway traffic safety; civil aviation; urban systems
DOT	Poland	Transportation	78/11	Indef	nb	Transportation agreement carried out, and projects funded under the 1987 US-Poland S&T agreement. Special interests are rail safety and highway basic science R&D

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
DOT	Regional (Africa)	Transportation	Variable	Variable	cr	Regional highway technical assistance; transport planning & development in cooperation with USAID
DOT	Regional (Africa)	Transportation	Variable	Variable	cr	Civil aviation technical assistance in Cape Verde, Egypt, Liberia, & Morocco
DOT	Regional (Asia)	Transportation	Variable	Variable	cr	Highway technical assistance in Kuwait
DOT	Regional (Asia)	Transportation	Variable	Variable	cr	Civil aviation technical assistance in China, Hong Kong, Indonesia, Japan, Jordan, Korea, Marshall Islands, Malaysia, Micronesia, Nepal, Oman, Pakistan, Palau, Saudi Arabia, Sri Lanka, and Taiwan
DOT	Regional (Asia)	Transportation	Variable	Variable	cr	Technical assistance to Saudi Arabia on transport system infrastructure establishment and training
DOT	Regional (Europe)	Transportation	Variable	Variable	cr	Civil aviation technical assistance in Austria, Belgium, Denmark, the FRG, France, Greece, Ireland, Israel, the Netherlands, Poland, Portugal, Spain, Switzerland, the United Kingdom

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
DOT	Regional (Oceania)	Transportation	Variable	Variable	cr	Civil aviation technical assistance in Brunei, Indonesia, & New Zealand
DOT	Regional (Oceania)	Transportation	Variable	Variable	cr	Highway technical assistance in Indonesia
DOT	Regional (S America)	Transportation	Variable	Variable	cr	Civil aviation technical assistance in Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Surinam, Uruguay, & Venezuela
DOT	Regional (W Hemis)	Transportation	Variable	Variable	cr	Highway technical assistance in Barbados & Costa Rica
DOT	Regional (W Hemis)	Transportation	Variable	Variable	cr	Civil aviation technical assistance in Barbados, Bahamas, Canada, Cayman Islands, COCESNA, Dominican Republic, Grenada, Haiti, Iceland, Jamaica, Mexico, Netherlands Antilles, Panama, Trinidad & Tobago & Turks and Caicos Islands
DOT	Romania	Transportation	71/11	Indef	nb	Cuurently inactive

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
DOT	Spain	Transportation	71/11	Indef	nb	Transportation planning exchanges; concrete structure research; seismic effects on bridge deck systems; two projects are funded under the US-Spain Agreement of Friendship, Defense & Cooperation, & are carried out by US universities
DOT	USSR	Transportation	88/05	Indef	nb	Government-to-government agreement on maritime search and rescue
DOT	USSR	Transportation	88/05	93/05	nb	Government-to-government agreement for cooperation in transportation S&T. DOT is Executive Agent
DOT	USSR	Transportation	88/05	Indef	nb	Government-to-government agreement on establishment of joint (maritime) radio navigation system
DOT	United Kingdom	Transportation	81/11	87/11	nb	Original agreement extended from 7/86 to 11/87; general transport system planning exchanges; civil aviation security
DOT	Yugoslavia	Transportation	80/06	Indef	nb	DOT participates in cooperation program and funding of research, under US-Yugoslav S&T agreement

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
EPA	Brazil	Environment	86/10	90/12		Agreement to provide technical assistance to CETESB, Sao Paulo state pollution control agency; formal agreement pending
EPA	Canada	Environment	85/10	Indef	nb	A second MOU outlines a plan of cooperative measures for dealing with accidental releases of pollutants which cause, or may cause, damage along the border & constitute a threat to public health, property or welfare; a Joint Contingency Plan is being developed
EPA	Canada	Environment	85/10	Indef	nb	MOU between EPA & Environment Canada includes pollution measurement & control, R&D & improved technologies & systems for pollution control
EPA	Canada	Environment	72/06	Indef	nb	US-Canadian governmental agreement for restoration & maintenance of the chemical, physical & biological integrity of the waters of the Great Lakes Basin ecosystem
EPA	Canada	Environment	85/11	Indef	nb	Third MOU provides for export, import & transit of hazardous wastes across the boundary for treatment, storage or disposal

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
EPA	China	Environment	80/01	Indef	nb	US-PRC Protocol on Environmental Cooperation (5-year renewals) involves five ongoing projects under two annexes on aquatic effects of environmental pollution; health research (lung cancer); modeling of air pollution transport & transformation; water pollution transport; & pollution of soil & groundwater. A 6th project, environmental management, under the newly-signed 4th Annex, is in planning
EPA	France	Environment	84/01	Indef	nb	Five-year renewable MOU between EPA & the Ministry of Environment; exchanges on drinking water, wastewater treatment & sludge management are current focal points

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
EPA	Germany, Fed Rep	Environment	74/01	Indef		Governmental agreement, five-year automatic renewal, with EPA & Ministry of Environment, Nature Protection & Reactor Safety as the lead agencies; broad range of cooperation on auto emissions, acid deposition, economic incentives, improved regulatory approaches, hazardous waste management & enforcement, chemical substances, pesticides, radiation, water pollution control, technologies for control of air pollution from stationary sources, protection of drinking water, soil pollution, etc.
EPA	Greece	Environment	Indef	Indef		No formal framework; current project on epidemiological systems & determination of cancer hot spots
EPA	India	Environment	86/01	Indef	nb	EPA works with GOI environmental authorities under the US-India Fund; principal project is the Ganges River cleanup; two joint toxicology research projects are being formulated with initiation expected in FY 89. EPA is reviewing two project proposals by NEERI.

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
EPA	Italy	Environment	87/03	Indef		At Italian request, EPA concluded a formal MOU with the newly-established Ministry of Environment; subsequent governmental reorganization has precluded implementation; ongoing contacts exist in the fields of dioxin control, wastewater management & solid waste management & recycling
EPA	Japan	Environment	75/01	Indef	nb	Self-renewing governmental agreement on environmental protection; 15 projects cover a wide range of issues including mobile & stationary source control, hazardous waste management, wastewater treatment, drinking water protection, management of contaminated bottom sediments, etc.
EPA	Korea	Environment			nb	A MOU between EPA and Korea Environment Agency was signed Nov. 2, 1987, but does not enter into force until the umbrella US-ROK S&T agreement is signed. Seven subjects for exchange were discussed at the 1987 meeting but none are under way

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
EPA	Mexico	Environment	83/08	Indef	nb	US-Mexican govern agreement for co the protection, nmental conservation of poperation in environment; spe improvement & are outlined in the border agreement; 1. s specific programs border sanitatio annexes to the San Diego & Tiju solution of the cooperation on d on problem at hazardous wastes uans; 2. border; 3.cooper discharges of transboundary sh ration on hazardous substa hipment of cooperation on tances; 4. air pollution fr transboundary smelters rom copper
EPA	Netherlands	Environment	79/01	Indef	nb	Self-renewing MO and the Ministry Physical Plannir of Housing, Environment. Cng, and broad range of tovers the same US-FRG agreement topics as the Ministry co-sport. EPA and the international synsored a major ozone, the thircymposium on of triennial synd in a series air-related issymposia on major ues

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AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
EPA	Poland	Environment	87/09	93/09		Agreement between EPA and the Ministry of Environment which may cover air & water pollution, hazardous waste management, effects of pollutants on flora & fauna, radiation, health effects of pollutants & environmental management & planning. EPA also participates in the US-Poland agreement on S&T Cooperation, and is developing projects on health effects, radiation, and hazardous waste management
EPA	Sweden	Environment	70/01	Indef	nb	Bilateral cooperation between EPA and the National Environmental Protection Board has gone on successfully since 1970 without any formal framework; principal subjects are acid deposition effects research & research on the health effects of pollutants

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
EPA	USSR		72/00	Indef		EPA and the new (1988) State Committee for Environmental Protection (GOSKOMPRIRODA), which incorporates the environmental responsibilities of GOSKOMGIDROMET, are the executive agencies for this intergovernmental agreement. Joint activities cover the areas of air and water, pollution, agricultural pollution, urban environments and park management, nature protection, marine pollution, biological and genetic effects of pollution, earthquake prediction, legal and administrative measures, and environmental education

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
EPA	USSR	Environment	72/05	Indef	nb	EPA & the GOSKOMGIDROMET are lead agencies for this self-renewing governmental agreement; projects cover the areas of air & water pollution, urban environments & park management, nature protection, pollution associated with agricultural practices, marine pollution, environmental effects on climate, earthquake prediction, environmental education & legal & administrative measures
EPA	Yugoslavia	Environment	87/00	93/00		EPA supports the US-Yugoslav agreement on scientific and technical cooperation with 20 active projects in such areas as health effects research, emissions from stationary and mobile sources, ecological research, and hazardous waste management
FWS	China	Natural Resources	86/11	Indef	20	Exchange of scientists to work on activities relating to endangered species
FWS	Egypt	Natural Resources	77/04	89/12	100 sfc	Training & research; technical assistance in natural areas management

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
FWS	India	Natural Resources	78/01	Indef	500 sfc	Research projects in endangered species & training in wildlife management; public education efforts
FWS	Multilateral	Natural Resources	87/01	Indef	20	Training & research in 8 Asian countries; 8 grants in support of biological diversity; USAID funding at \$260,000
FWS	Multilateral	Natural Resources	87/01	Indef	10	Training & research in 13 Near East countries; 12 grants in support of biological diversity; USAID funding at \$186,000
FWS	Multilateral	Natural Resources	87/01	Indef	499	Institution building & training in western hemisphere countries; grants & projects in support of regional capabilities for managing wildlife
FWS	Pakistan	Natural Resources	78/01	92/12	500 sfc	Research in endangered species; training in wildlife management; conservation education
FWS	USSR	Natural Resources	72/05	Indef	15	Exchange of scientists to work on activities relative to endangered species

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
FWS	Various S.Pacific	Natural Resources	88/00	91/06	1.5	Partial support for an inventory of wetlands of international importance in the South Pacific in support of the wetlands convention
HHS	Australia	Biomedical Sciences	76/08	Indef		NIH/National Library of Medicine MEDLARS Agreement with National Library of Australia; quid pro quo interlibrary exchange
HHS	Australia	Food & Drug Reg.	86/08	Indef		FDA MOU; dry milk products for certification for export to the U.S.
HHS	Australia	Food & Drug Reg.	79/11	Indef		FDA MOU; shellfish sanitation & certification for export to the U.S.; annual inspection of growing area & processing facilities; inactive due to no shipping
HHS	Austria	Biomedical Sciences	87/04	92/04	10	Agreement between NIH & Austrian Science Foundation for the support of biomedical scientist exchanges
HHS	Belgium	Biomedical Sciences	84/02	Indef		NIH agreement with the Belgian National Fund for Support of Research (FNRS) to obtain funding for Belgian scientists to work in U.S. laboratories

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
HHS	Belgium	Food & Drug Reg.	74/12	Indef		MOU; FDA recognizes, certificate of analysis from authorities of dry government and milk products
HHS	Brazil	Biomedical Sciences	77/01	Indef		Library of NIH/National ARS Agreement Medicine MEDLatino-Americano with Centro de Informacia de Salude (BIRExchanges interlibrary
HHS	Bulgaria	Biomedical Sciences	86/11	89/11		Agreement between NIH and Bulgarian Medical Academy for support of exchanges under the scientist ex-Bulgaria umbrella U.S. Exchanges Ag
HHS	Canada	Biomedical Sciences	70/01	Indef		Library of NIH/National ARS Agreement Medicine. MEInstitute for with Canada Technical Scientific & (CISTI); quid pro quo interlib
HHS	Canada	Food & Drug Reg	88/06	93/06		Medical Service FDA MOU with Department of National Branch, DepaCare; monitor Health & Welness & sanitary food, beverage provided on common services proeen Canada & U.S. carriers bet

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
HHS	Canada	Food & Drug Reg.	79/05	Indef		FDA MOU with Health Protection Branch, Department of National Health & Welfare; covers standards for good laboratory practices (GLPs) for non-clinical laboratories and establishes inspection standards
HHS	Canada	Food & Drug Reg.	74/12	Indef		FDA MOU with Health Protection Branch, National Health & Welfare; radiation transmission & human exposure from electronic products; control of radiation emission and human exposure from electronic products
HHS	Canada	Food & Drug Reg.	84/04	Indef		FDA MOU with National Health & Welfare on sanitary practices prevailing in the shellfish industry of Canada & the U.S.
HHS	Canada	Food & Drug Reg.	73/10	Indef		FDA MOU with Health Protection Branch, National Health and Welfare; drug, GMPs pharmaceuticals inspection; mutual cooperation and exchange of drug plant inspection information

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
HHS	Canada	Health Statistics	87/01	89/12		Cooperation between the PHS National Center for Health Statistics and Vital Statistics Council for Canada; Statistics Canada Advisory Commission on health statistics
HHS	China	Biomedical Sciences	83/06	89/06	2	Agreement between National Institute of Neurological and Communicative Disorders and Stroke, NIH, and the Shanghai Brain Research Institute, Acad. of Sciences
HHS	China	Biomedical Sciences	79/06	93/06	239	Cooperation under Health Protocol with Chinese Academy of Medical Sciences; cancer; cardiovascular diseases; infectious diseases; environmental health; human genetics; reproductive physiology; immunology; biomedical information science; food & drugs; mental health; public health and health services
HHS	China	Biomedical Sciences	87/08	92/08		Agreement between the National Eye Institute, NIH, and the Zhongshan Ophthalmic Center, Chinese Acad. Med. Sciences

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
HHS	China	Biomedical Sciences	83/05	88/05	2	Agreement between NIH & the Chinese National Academy of Sciences on basic biomedical sciences
HHS	China	Food & Drug Reg.	88/02	93/02		Agreement to regulate ceramicware intended for use in the preparation, serving or storage of food or drink and offered for export to the U.S.
HHS	Colombia	Biomedical Sciences	81/01	Indef		National Library of Medicine MEDLARS Agreement with the Pan American Federation of Associations of Medical Schools; quid pro quo interlibrary exchanges
HHS	Denmark	Biomedical Sciences	84/01	88/12		International Collaborative Effort on behalf of the National Center of Health Statistics on Perinatal & Infant Mortality
HHS	Denmark	Food & Drug Reg.	75/02	Indef		MOU; FDA recognizes certificate of analysis from government authorities on dry milk products

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
HHS	Egypt	Biomedical Sciences	82/01	91/11	8 mil	AID-funded NIH program under the Congressionally mandated Middle East Regional Cooperative Program established following the Camp David Accord; epidemiologic & immunologic studies on vector-borne diseases
HHS	Egypt	Biomedical Sciences	85/10	89/05	2.1 mil	U.S.-Egypt agreement on Health Cooperation to develop projects on environmental health; epidemiology of respiratory infections, eye diseases, genetic studies of congenital anomalies, lymphoma/leukemia research, biomedical instrumentation, drugs, biologics, health statistics; and emergency medical services. AID-funded
HHS	Finland	Biomedical Sciences	82/10	Indef		Interagency agreement between PHS & the Ministry of Social Affairs & Health of Finland on occupational safety & health, food & drugs, alcohol abuse, & health services, vaccine development
HHS	Finland	Food & Drug Reg	84/01	Indef		MOU; FDA recognizes certificate of analysis from government authorities on food products

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
HHS	France	Biomedical Sciences	69/01	Indef		National Library of Medicine MEDLARS Agreement with the French Institute of Health & Medical Research; quid pro quo interlibrary exchanges
HHS	France	Biomedical Sciences	84/10	89/10	132	Agreement between NIH & the French Institute of Health & Medical Research on cancer, cardiovascular, pulmonary, immunology & infectious diseases, instrumentation, biomedical engineering and neuro-sciences, instrumentation; technology assessment, and AIDS research
HHS	France	Food & Drug Reg.	87/01	Indef		MOU; FDA recognizes certificate of analysis from government authorities on dry milk products
HHS	France	Food & Drug Reg.	86/07	Indef		MOU; mutually recognized good laboratory practices (GLP) inspections
HHS	Germany, Fed Rep	Biomedical Sciences	69/01	Indef		National Library of Medicine MEDLARS Agreement with the FRG Institute of Medical Documentation & Information; quid pro quo interlibrary exchanges

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HHS	Germany, Fed Rep	Biomedical Sciences	76/09	91/09	113	HHS Agreement with the Ministry of Research & Technology in the Field of Biomedical Research & Technology; cardiovascular, pulmonary, & blood diseases; cancer research; arthritis and AIDS research
HHS	Germany, Fed Rep	Biomedical Sciences	84/01	88/12		International Collaborative Effort of the National Center for Health Statistics on Perinatal & Infant Mortality
HHS	Guatemala	Biomedical Sciences	79/01	Indef	235	Ministry of Health, Universidad del Valle, and the U.S. Centers for Disease Control collaborate in vector-borne parasitic disease research and training
HHS	Hungary	Biomedical Sciences	77/04	87/12	43	NIH projects under the U.S.-Hungary Cultural, Education & Science agreement; cardiovascular, pulmonary, & blood diseases; individual health sciences exchanges
HHS	Hungary	Biomedical Sciences	81/02	Indef	17	Agreement between the National Cancer Institute & the Hungarian National Institute of Oncology for cancer research

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AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
HHS	Ireland	Food & Drug Reg	88/01	93/01		...ring ...s and FDA agreement cowported to caseins, caseinat mixtures thereof the U.S. ...er a Plan ...tion with Activities are unbor & Social for Mutual Cooperas of the Ministry of Alcoholism; Affairs in the abeneficial alcohol abuse & study covers mutually nt studies exchanges, work- programs, and job Israeli
HHS	Israel	Biomedical Sciences	83/03	88/03		Agreement with the Israeli Ministry of Health; covers areas of biomedic & health of mutual interest statistics
HHS	Italy	Biomedical Sciences	77/11	Indefin.	190	the umbrella Agreement under the Italian S&T agreement with in health & Ministry of Health, able every 3 biomedicine; renironmental years; covers encular & health, cardiovas, cancer, pulmonary disease, cation, biomedical commues & infectious disease immunology, humanabolic reproduction, newresearch, diseases, visions, dental laboratory anima & perinatal research, aging, rosciences medicine, and new

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AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
HHS	Italy	Biomedical Sciences	81/07	87/12		Projects under the umbrella S&T agreement; psychopharmacology research between the National Institute of Mental Health & the University of Pisa
HHS	Ivory Coast	Disease Control	87/05	Indef		Centers for Disease Control & Ministry of Health collaboration in HIV-1 and HIV-2 epidemiology, laboratory surveillance and research
HHS	Japan	Biomedical Sciences	74/05	89/05	95	Agreement between the National Cancer Institute & the Japan Society for the Promotion of Science in the area of cancer research
HHS	Japan	Biomedical Sciences	74/01	Indef		National Library of Medicine MEDLARS Agreement; quid pro quo interlibrary exchanges
HHS	Japan	Biomedical Sciences	84/09	88/09	14	Gerontology research; agreement between the National Institute on Aging & Tokyo Metropolitan Institute of Gerontology
HHS	Japan	Biomedical Sciences	76/01	91/01		Vision research; agreement between the National Eye Institute & the Japan Society for the Promotion of Science

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HHS	Japan	Biomedical Sciences	80/01	88/06	23	Projects under the non-energy umbrella S&T agreement; exchanges, work-study programs, & joint research; covers cardiovascular diseases, laboratory animals, toxicology, recombinant DNA, vaccine development, antiviral agents, & alcohol-related problems
HHS	Japan	Biomedical Sciences	65/04	Indef	185	U.S.-Japan Cooperative Medical Sciences Program; projects in infectious & viral diseases, malnutrition, environmental mutagenesis & carcinogenesis, & AIDS
HHS	Japan	Food & Drug Reg.	83/04	Indef		Mutual acceptance of inspectional data concerning good laboratory practice (GLP) with Pharmaceutical Affairs Bureau, MOH
HHS	Japan	Food & Drug Reg.	62/10	Indef		MOU with FDA on sanitation of shellfish for export; inactive since 1984 since there have been no shellfish exports
HHS	Kenya	Biomedical Sciences	79/01	Indef	200	Malaria research by the Centers for Disease Control & collaborating Kenyan agencies
HHS	Korea	Biomedical Sciences	76/05	88/10		Genetic engineering under U.S.-Korea S&T agreement

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HHS	Korea	Biomedical Sciences	86/04	91/04		Toxicological data information exchange & training, Korean Research Institute of Chemical Technology
HHS	Mexico		88/02	93/02		General umbrella agreement between the FDA Mexican SSA to cooperate in the scientific and regulatory fields of health
HHS	Mexico	Biomedical Sciences	83/12	88/12	24	Joint Working Group on Health, U.S.-Mexico Mixed Commission on Science & Technology; covers diarrheal diseases, maternal & child health (nutrition & breast feeding), diabetes and pregnancy biomedical instrumentation & repair
HHS	Mexico	Biomedical Sciences	76/01	Indef		National Library of Medicine MEDLARS Agreement with Centro Nacional de Informacion y Documentacion en Salud (CENIDS); quid pro quo interlibrary exchange
HHS	Mexico	Biomedical Sciences	84/01	90/12	100	Field epidemiology training by the Centers for Disease Control with the Secretaria de Salud

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HHS	Mexico	Biomedical Sciences	82/03	88/12		National Institute of Alcohol Abuse & Alcoholism Agreement for Scientific Cooperation with the Mexican Institute of Psychiatry includes exchanges, work-study programs & the conduct of joint collaborative alcohol research studies
HHS	Mexico	Biomedical Sciences	84/01	88/11	5	Plan for Scientific Cooperation between NIH & the Center for Research & Advanced Studies, National Polytechnic Institute, Mexico (CINVESTAV IPN); covers neurosciences & endocrinology, neurobiology & anaesthesiology, molecular aging, liver metabolism & drug mechanisms in liver disease treatment, pathobiology & hormonal regulation of membrane transport systems
HHS	Mexico	Food & Drug Reg.	81/10	Indef		FDA MOU with Secretaria de Salud on sanitary practices prevailing in the shellfish industries of Mexico & U.S.

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
HHS	Multilateral	Biomedical Sciences	79/03	91/09	5,610	Child survival & combatting childhood communicable diseases; Centers for Disease Control program of training & logistics planning for advancement of childhood immunization programs, malaria prophylaxis & diarrheal disease control; covers 12 African countries: Burundi, Central African Republic, Guinea, Ivory Coast, Lesotho, Liberia, Malawi, Nigeria, Rwanda, Swaziland, Togo, & Zaire (USAID funded)
HHS	Multilateral	Biomedical Sciences	84/01	89/12	31	International Collaborative effort on Perinatal and Infant Mortality with Denmark, FRG, Israel, Japan, Norway, Sweden and the U.K. by the National Center for Health Statistics
HHS	Netherlands	Food Sciences	78/03	Indef		Dry milk products; FDA MOU recognizes certificate of analysis from government authorities
HHS	New Zealand	Food & Drug Reg	75/11	Indef		FDA MOU covering dry milk products certification for export to the U.S.

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
HHS	New Zealand	Food & Drug Reg	80/10	Indef		MOU; shellfish sanitation & certification for export to U.S.; annual inspection of growing areas & processing facilities
HHS	Norway	Food & Drug Reg.	82/02	Indef		MOU; FDA recognizes certificate of analysis from government authorities for dry milk products
HHS	Philippines	Biomedical Sciences	87/06	89/12	265	Centers for Disease Control and Dept. of Health program in field epidemiology training (USAID funded)
HHS	Philippines	Food & Drug Reg.	86/09	Indef		MOU signed 09/86 covering certification of selected foods for export to the U.S.
HHS	Poland	Biomedical Sciences	84/10	Indef	294	Agreement between HHS & the Polish Ministry of Health & Social Welfare; cooperation on mental health problems; cardiovascular & pulmonary diseases, individual health scientist exchanges, cancer research & mental health
HHS	Romania	Biomedical Sciences	74/12	Indef		U.S.-Romania cooperation & individual health scientist exchanges; renewable every two years

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
HHS	Saudi Arabia	Biomedical Sciences	86/10	93/12	146	CDC field epi training prog ram
HHS	Saudi Arabia	Biomedical Sciences	74/09	90/09		Under U.S.-Sa Commission ecudi Joint cooperation tonic of knowledge to enable sharing technology for transfer of control & emer food & drug services emergency medical
HHS	Sierra Leone	Biomedical Sciences	82/01	Indef		Long-term agr Centers for keement between and Ministry Disease Control joint research of Health in haemorrhagic ch for viral fevers
HHS	Spain	Biomedical Sciences	83/01	88/12		Cooperative l alcohol rese supported un arch projects of Complement der the provisions Seven of the tary Agreement Friendship, l Agreement on Cooperation l Defense & and Spain between the U.S.
HHS	Sweden	Biomedical Sciences	68/10	Indef		National Lib MEDLARS Agre Karolinska l rary of Medicine ement with quo interlib Institute; quid pro rary exchange

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AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
HHS	Sweden	Biomedical Sciences	79/05	Indef		FDA MOU; agreement to implement good laboratory practices
HHS	Sweden	Food & Drug Reg.ces	72/10	Indef		FDA MOU; mutual acceptance of drug inspection reports on good manufacturing practices
HHS	Sweden	Food Sciences	78/01	Indef		MOU; FDA recognizes certificate of analysis from government authorities on dry milk
HHS	Switzerland	Biomedical Sciences	80/01	Indef		National Library of Medicine MEDLARS Agreement with the Documentation Service of the Swiss Academy of Medical Sciences; quid pro quo interlibrary exchange
HHS	Switzerland	Food & Drug Reg.	85/04	Indef		FDA MOU; mutual acceptance of non-clinical laboratory inspection reports and good laboratory practices
HHS	Switzerland	Food & Drug Reg.	68/10	Indef		FDA MOU; mutual acceptance of drug inspection reports relating to good manufacturing practices
HHS	Thailand	Biomedical Sciences	84/04	89/04		NIH activity under S&T Agreement for aplastic anemia

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HHS	USSR	Biomedical Sciences	72/05	92/05	344	Under government-to-government health agreement on cancer, cardiovascular disease, environmental health, arthritis, biomedical communication, eye disease & individual health scientist exchange
HHS	USSR	Biomedical Sciences	74/06	92/06		Under government-to-government agreement on artificial heart research & development
HHS	United Kingdom	Biomedical Sciences	68/01	Indef		National Library of Medicine MEDLARS Agreement with the British Library; quid pro quo interlibrary exchange
HHS	United Kingdom	Biomedical Sciences	86/06	Indef		FDA MOU; acceptance of medical device inspection reports
HHS	United Kingdom	Biomedical Reg.	80/09	Indef		FDA MOU; establishes procedures to assure safety of imported shellfish
HHS	United Kingdom	Food & Drug Reg.	88/03	93/03		FDA/EPA MOU with Dept. of Health and Social Security on reciprocal recognition of Good Laboratory Practice program (GLP)
HHS	United Kingdom	Food & Drug				

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
HHS	Yugoslavia	Biomedical Sciences	74/11	92/11	365	Under U.S.-Yugoslavia agreement on cooperation in S&T for cardiovascular, pulmonary & metabolic diseases, neurosciences, cancer, human reproduction & individual health scientist exchanges, & alcohol research; uses U.S.-Yugoslav Joint Fund
HHS	Zaire	Biomedical Sciences	84/01	Indef	400	Belgian Ministry of Health, U.S. Centers for Disease Control, National Institutes of Health, Belgian Institute of Tropical Medicine and U.S. Armed Forces Institute of Pathology cooperate in AIDS surveillance, research and prevention
NASA	Australia	Space & Aeronautics	87/09	97/08		Sounding rocket launches from Australian territory
NASA	Australia	Space & Aeronautics	84/10	89/10		Balloon launches within Australia
NASA	Australia	Space & Aeronautics	81/07	90/02	nb	Establishment of tracking stations in Australia
NASA	Australia	Space & Aeronautics	85/07	90/07	nb	Long-duration balloon agreements

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NASA	Canada	Space & Aeronautics	88/09	Indef	rnk	Entering Phase C/D of Space Station Program; Detailed Design & Development; total funding for international partners in excess of \$7.0 billion, Canadian hardware accounting for over \$1 billion
NASA	Canada	Space & Aeronautics	84/03	Indef	114	Cooperative participation in Upper Atmospheric Research Satellite (UARS), including ozone monitoring
NASA	Chile	Space & Aeronautics	87/08	87/09	nb	Antarctic expedition to research ozone depletion
NASA	Chile	Space & Aeronautics	85/08	93/08	nb	Use of Easter Island Airport for Shuttle emergency landing
NASA	France	Space & Aeronautics	87/03	Indef	19	Cooperative participation in TOPEX/POSEIDON oceanography mission
NASA	France	Space & Aeronautics	84/09	94/09	nb	Use of Hao (French Polynesia) for Shuttle emergency landing
NASA	Gambia	Space & Aeronautics	88/03	98/03	nb	Use of Banjul International Airport as STS emergency landing site
NASA	Germany, Fed Rep	Space & Aeronautics	Indef	Indef	nb	Reimbursable flight of German D-2 Spacelab mission for microgravity research on Shuttle

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NASA	Germany, Fed Rep	Space & Aeronautics	82/08	Indef	2,700	Cooperative participation in Rosat x-ray survey satellite
NASA	Germany, Fed Rep	Space & Aeronautics	81/09	Indef	51	Cooperative participation in Gamma Ray Observatory program
NASA	Germany, Fed Rep	Space & Aeronautics	77/10	Indef	71	Cooperative participation in Galileo mission to Jupiter
NASA	Germany, Fed Rep	Space & Aeronautics	87/10	Indef	nb	German X-brand Synthetic Aperture Radar (X-SAR) to fly with SIR-C on
NASA	Italy	Space & Aeronautics	84/03	Indef	11	Cooperative development of the Tethered Satellite System
NASA	Italy	Space & Aeronautics	84/03	Indef	9	Cooperative participation in Lageos geodynamics satellite
NASA	Japan	Space & Aeronautics	85/01	90/01	nb	Use of Japanese airport for Shuttle emergency landing
NASA	Japan	Space & Aeronautics	Indef	Indef	nb	Reimbursable flight of Japanese spacelab mission on shuttle
NASA	Japan	Space & Aeronautics	88/01	Indef	nb	Direct reception of data from Japan's JERS-1 spacecraft at a NASA receiving station

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AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NASA	Japan	Space & Aeronautics	88/09	Indef	rmk	Entering Phase C/D of Space Station Program; Detailed Design and Development; total funding with international partners in excess of \$7.0 billion; Japanese hardware accounting for \$2 billion
NASA	MULTILATERAL (ESA)	Space & Aeronautics	77/10	Indef	96	Cooperative participation in the development & use of the Hubble Space Telescope
NASA	Morocco	Space & Aeronautics	87/01	97/01	nb	Use of Ben Guerir airport for Shuttle emergency landing
NASA	Multilateral (ESA)	Space & Aeronautics	88/09	Indef	rmk	Entering Phase C/D of Space Station Program; Detailed Design and Development; total funding with all international partners in excess of \$7.0 billion, ESA hardware accounting for \$4 billion
NASA	Multilateral (ESA)	Space & Aeronautics	86/01	Indef	nb	Agreement for tracking & data reception for the ESA Earth Remote Sensing Satellite (ERS-1)
NASA	Multilateral (ESA)	Space & Aeronautics	79/03	Indef	10	Ulysses; cooperative mission to study the poles of the sun
NASA	Norway	Space & Aeronautics	75/07	Indef	nb	Agreement for sounding rocket launches from Andoya, Norway

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NASA	Saudi Arabia	Space & Aeronautics	83/10	Indef	nb	Cooperative S&T studies projects, particularly remote sensing
NASA	Senegal	Space & Aeronautics	83/01	88/01	nb	Use of Dakar airport Shuttle emergency land for landing
NASA	Spain	Space & Aeronautics	84/08	Indef	nb	Use of Spanish airspace Shuttle emergency land for landing
NASA	Sweden	Space & Aeronautics	73/08	Indef	nb	Agreement for sounding launches from Esrange ge, Sweden
NASA	USSR	Space & Aeronautics	87/04	Indef	nb	Cooperation in 5 areas space science and areas of applications. Exchange notes in May extended range of US-USSR Civil Space led the 1987 to include opportunities Agreement fly scientific instruments to each other's spacecrafts on exchange results of craft and independent studies on solar system exploration
NASA	United Kingdom	Space & Aeronautics	84/03	Indef	114	Cooperative participation in Upper Atmospheric Research Satellite, including ozone monitoring
NASA	United Kingdom	Space & Aeronautics	Indef	Indef	nb	Flight of British payload specialist on STS
NASA	United Kingdom	Space & Aeronautics	82/08	Indef	3	Cooperative participation in Rosat x-ray survey satellite

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NIST	Canada	Basic Sciences	88/09	93/09	nb	MOU with National Research Council of Canada for collaboration with respect to development and online dissemination of scientific numeric databases
NIST	China	Metrology	79/01	89/05	nb	Protocol with the State Bureau of Metrology under the umbrella S&T agreement; joint studies in metrology, standards (including engineering standards), & related applied sciences; temperature, electrical, optical, length, mass, & time measurements & standards; guidelines, protocols, & standards for electronic data processing; building technology; analytical chemistry; metallic & non-metallic materials measurements & standards; applied mathematics

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NIST	France	Engineering	86/12	91/12	nb	Cooperation in building technology; joint research & exchanges; extensive collaboration with the Centre Scientifique et Technique du Batiment in environmental engineering, materials durability, fire research, accoustics, evaluation of building systems, plumbing, & building economics
NIST	France	Materials Scien	84/10	89/09	nb	Agreement with Institut Max von Laue-Paul Langevin; development of the use of cold neutrons in materials research; NBS is installing a cold source, guide system & instrumentation; the Institut has operated a cold source since 1972 & installed a second source in 1986 for use in developing new instruments; studies in nuclear & fundamental physics

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NIST	Hungary	Metrology	84/11	Indef	nb	Cooperation with the Research Institute for Technical Physics under the umbrella S&T agreement; short-term exchange of scientists; extended visits in cooperating laboratories; joint research; intercomparison of national standards; information exchanges
NIST	Hungary	Metrology	77/04	Indef	nb	Cooperation with the Hungarian National Office of Measures under the umbrella S&T agreement; annual exchanges of up to 16 person-weeks per side in the areas of measurements & standards
NIST	India	Basic Sciences	74/10	Indef	sfc	Projects conducted under the US-Indo Joint Commission; includes 11 projects in materials and physical sciences in cooperation with 20 Indian institutions; expansion of the program was proposed in FY 1987 through 8 additional projects in materials science and 10 more in physical sciences; in FY 1988, 5 additional projects were proposed

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AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NIST	Japan	Telecommunications	84/10	89/10	nb	Agreement with the Nippon Telegraph & Telephone Public Corporation; joint research on semiconductors, telecommunications, computers & computer networking, time & frequency measurements, & related fields
NIST	Korea	Materials Science	86/09	89/09	nb	Agreement with Korea Advanced Institute of Science & Technology; studies on alloy formation by chemically induced interface migration
NIST	Korea	Metrology	86/10	89/10	nb	Agreement with the Korea Institute of Machinery & Metals; investigation of electrodeposited amorphous alloys for application in small scale industrial processes with emphasis on wear, corrosion, & magnetic performance

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NIST	Korea	Metrology	86/06	89/06	nb	Agreement with the Korea Standards Research Institute to improve knowledge & engineering practices in measuring mechanical properties of materials at low temperatures; low pressure measurement techniques; methodology development for secondary ion mass spectrometric analysis
NIST	Multilateral	Materials Science	87/05	Indef	nb	International accord with France, UK, Italy, Canada, Japan, FRG, & Commission of European Communities; participation in the Versailles Project on Advanced Materials (VAMAS) which now operates independent of the economic heads; VAMAS aims to introduce advanced materials into high-tech products & engineering structures, & encourage trade through agreement on codes of performance; NBS represents the US & chairs the steering committee

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NIST	USSR	Metrology	78/12	88/12	nb	Cooperation with the USSR Academy of Sciences in thermal physics & thermodynamics, materials science, spectroscopy, chemistry & chemical kinetics, & cryogenic science; exchange of scientists; information & documentation exchanges; joint meetings & seminars; joint research; exchanges are on a receiving-side-pays basis
NIST	Yugoslavia	Basic Sciences	80/06	Indef	250	Projects conducted under the umbrella S&T agreement; 40 active projects with Yugoslav institutions in FY 1988 covering a wide range of mutual interests
NOAA	Argentina	Space Technologies	84/09	Indef		MOU for direct reception & distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 & Landsat-5
NOAA	Australia	Space Technologies	84/03	Indef		MOU for direct reception & distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 & Landsat-5

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NOAA	Brazil	Space Technologies	84/05	Indef		MOU for direct reception & distribution of Landsat data at Landsat ground station; extends through life of Landsat-4 & Landsat-5
NOAA	Bulgaria	Fisheries	77/02	88/07		Governing International Fishery Agreements established on a bilateral basis; which foreign conditions under are granted fishing vessel resources access to fish Exclusive within the U.S. Economic Zone
NOAA	Canada	Atmospheric Science	85/06	90/06		MOU to improve the cooperation of climate and coordination and related programs undertaken activities jointly by the U.S. and Canada
NOAA	Canada	Space Technologies	84/07	Indef		MOU for direct reception & distribution of Landsat data at Landsat ground station; extends through life of Landsat-4 & Landsat-5
NOAA	China	Atmospheric Science	79/05	89/05	53	Protocol on Cooperation in joint Atmospheric Studies; training meteorologic s

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NOAA	China	Marine Science	79/05	89/05	270	Under the protocol on cooperation in the field of Marine and Fisheries S&T information exchange; cooperative research (such as TOGA); training (such as scientific training and data management); and supply of equipment
NOAA	China	Space Technologies	85/07	Indef		MOU for direct reception & distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 & Landsat-5
NOAA	China (PRC)	Fisheries	85/11	90/07		Governing International Fishery Agreements established on a bilateral basis, conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. Exclusive Economic Zone
NOAA	Denmark/Faroe Island	Fisheries	80/01	89/07		Governing International Fishery Agreements established on a bilateral basis, conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. Exclusive Economic Zone

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NOAA	EEC	Fisheries	77/06	89/07		Governing International Fishery Agreements established on a bilateral basis, conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. Exclusive Economic Zone.
NOAA	European Space Agency	Space Technologies	84/02	Indef		MOU for direct reception and distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 and Landsat-5
NOAA	France	Marine Science	69/11	Indef		U.S.-France cooperation in oceanography; joint multidisciplinary oceanographic research; information & data exchanges
NOAA	France	Space Technologies	86/03	96/03		France provides onboard data collection system flown on NOAA polar-orbiting satellite; France also provides the data processing system for ARGOS

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NOAA	German Dem Rep	Fisheries	77/03	90/08		Governing International Fishery Agreements established on a bilateral basis, conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. Exclusive Economic Zone
NOAA	Iceland	Fisheries	84/11	89/07		Governing International Fishery Agreements established on a bilateral basis, conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. Exclusive Economic Zone
NOAA	India	Earth Sciences	74/10	Indef		Two joint research projects in solar-terrestrial physics under the Indo-U.S. Subcommission on S&T
NOAA	India	Space Technologies	84/10	Indef		MOU for direct reception and distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 and Landsat-5

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NOAA	Japan	Fisheries	77/11	89/12		Governing International Fishery Agreements established on a bilateral basis, conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. Exclusive Economic Zone
NOAA	Japan	Marine Science	64/01	Indef		US-Japan Cooperative Program in Natural Resources; joint multidisciplinary research projects; information & data exchange
NOAA	Japan	Space Technologies	83/08	Indef		MOU for direct reception & distribution of Landsat data at Landsat ground station; extends through the life of andsat-4 & Landsat-5
NOAA	Korea (ROK)	Fisheries	77/03	89/07		Governing International Fishery Agreements established on a bilateral basis, conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. Exclusive Economic Zone
NOAA	Mexico	Earth Sciences	72/06	Indef	100	Assistance in marine data collection & air pollution studies; Gulf of Mexico acid rain & Mexico City air pollution

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NOAA	Mexico	Fisheries	86/11	88/11		Joint fisheries research projects in the Gulf of Mexico & Pacific Ocean
NOAA	Mexico	Marine Sc. (Pacific)	86/11	88/11	NA	A MOU for cooperative research on shared resources in the Pacific and for the exchange of scientific information and cooperative research on the fisheries sector
NOAA	Mexico	Marine Science(Gulf)	86/11	88/11	NA	A MOU for cooperative research on shared resources in the Gulf of Mexico for the exchange of scientific information and cooperative research on the fisheries sector
NOAA	Mexico	Stats/Data Exchange'	88/06	88/11	NA	A MOU for the exchange of scientific and economic data and information on the fisheries sector
NOAA	Multilateral	Marine Science	var.	var.		Governing International Fishery Agreements (GIPAS) with the European Community, Japan, Korea (ROK), China (PRC), Taiwan, Poland, Denmark, German Democratic Republic, Iceland, and USSR

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NOAA	Multilateral	Marine Science	var.	var.		Governing International Fishery Agreements (GIFAs) with the European Community, Japan, Korea (ROK), China (PRC), Taiwan, Poland, Denmark, German Democratic Republic, Iceland, and USSR
NOAA	Multilateral (ESA)	Space Technologies	84/02	Indef		MOU for direct reception & distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 & Landsat-5
NOAA	Pakistan	Space Technologies	84/11	Indef		MOU for direct reception & distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 & Landsat-5
NOAA	Poland	Fisheries	77/02	91/07		Governing International Fishery Agreements established on a bilateral basis, conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. Exclusive Economic Zone

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AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NOAA	Poland	Marine Science	74/10	Indef		Cooperative research on ecosystem dynamics, stock assessment methodology, and resource analysis in the Antarctic and northwest Atlantic
NOAA	Romania	Fisheries	78/01	88/12		Governing International Fishery Agreements established on a bilateral basis, conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. Exclusive Economic Zone Romania never signed the renegotiated GIPA
NOAA	Saudi Arabia	Atmospheric Sciences	75/02	90/02		Technical Cooperation Agreement; cooperation in integrating Saudi meteorological services & supporting research programs
NOAA	Saudi Arabia	Space Technologies	84/09	Indef		MOU for direct reception & distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 & Landsat-5
NOAA	South Africa	Space Technologies	83/10	Indef		MOU for direct reception & distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 & Landsat-5

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NOAA	Spain	Marine Science	83/05	88/05	20	Sardine Anchovy Recruitment Program conducted under the U.S/Spain bilateral science and technology agreement.
NOAA	Thailand	Space Technologies	85/09	Indef		MOU for direct reception & distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 & Landsat-5
NOAA	USSR	Atmospheric Science	72/05	92/05	60	Agreement on Cooperation in the Field of Environmental Protection; exchange of scientists, information exchange, and joint research on influence of environmental changes on climate
NOAA	USSR	Marine Science	73/06	87/12		Agreement on Cooperation in Studies of the World Oceans; currently no cooperative activities
NOAA	United Kingdom	Space Technologies	74/09	89/09		United Kingdom provides the Stratospheric Sounding Unit (SSU) for flight on NOAA satellites
NOAA	United Kingdom	Space Technologies	86/02	94/02		United Kingdom will provide an Advanced Microwave Sounding Unit (AMSU) for flight on future NOAA spacecraft

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AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NPS	Burma	Natural Resources	87/03	Indef	301 sfc	Technical assistance in conservation, resource management, & protected areas management; other funding of \$23,000
NPS	Canada	Natural Resources	Indef	Indef	15	Policy coordination; US-Canada Joint Commission on National Parks; joint World Heritage nomination; Cabin Creek Coal Mine policy coordination; supplemental funding from other sources of \$30,000
NPS	China	Natural Resources	79/01	89/01	41	Training and exchange; US-China Cultural Accord; natural and cultural heritage; other funding of \$49,000
NPS	India	Heritage Site Plan'g	88/01	Indef	3,500 sfc	Joint planning and specialized resource assessments for Taj Mahal National Historical Park and Buddhist sites
NPS	India	Natural Resources	79/10	Indef	298 sfc	Technical assistance; park & conservation planning & management, technical assistance & training; funding from other sources \$2,302,000

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NPS	Japan	Natural Resources	86/11	91/11	10	Exchange; US-Japan agreement on development & utilization of natural resources; US-Japan Panels: national parks & other natural areas, conservation, recreation & parks, & city parks & urban affairs
NPS	Multilateral	Natural Resources	Ongoing	Ongoing	10	Technical assistance & information exchange; Man & the Biosphere (MAB) Program; biological surveys & monitoring; reference text development; biosphere reserves; participants include Canada, Mexico, Rwanda, FRG & all MAB countries; other US government funding of \$30,500
NPS	Multilateral	Natural Resources	Ongoing	Ongoing	10	Technical assistance; national park development; participants include African countries, Greece, Malaysia, Nepal, Saudi Arabia, Palau & Portugal; other US government funding of \$90,000; other funding of \$66,900

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NPS	Multilateral	Natural Resources	Ongoing	Ongoing	30	Technical assistance; Western Hemisphere Convention & Caribbean Basin Initiative park development; participants include Argentina, Brazil, Mexico, Grenada, Jamaica, St. Vincent & the Grenadines, Caribbean Basin & Latin America; other US government funding of \$10,813; other funding of \$201,067
NPS	Multilateral	Natural Resources	Ongoing	Ongoing	45	Information exchange; Western Hemisphere Convention & Caribbean Basin Initiative park & protected area development; participants include Brazil, British Virgin Islands, Caribbean Basin & Latin America; other US government funding of \$150,000; other funding of \$7,200
NPS	Multilateral	Natural Resources	Ongoing	Ongoing	17	Training & information exchange; training for foreign park professionals in US National Parks, provision of technical information on parks & protected areas to USAID missions and foreign governments

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NPS	Multilateral	Natural Resources	Ongoing	Ongoing		Training; Peace Corps Volunteer training in national parks & conservation; participants include Malawi, Morocco & Sierra Leone; other US government funding of \$18,000
NPS	Multilateral	Natural Resources	Ongoing	Ongoing	53	Policy coordination; World Heritage Site nomination; cultural resource cooperation with ICOMOS; participants includes World Heritage Convention countries
NPS	Multilateral	Natural Resources	Ongoing	Ongoing	257	Training; Western Hemisphere Convention & Caribbean Basin Initiative park & protected area development; participants include Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Panama, Peru, Venezuela, Barbados, Bermuda, Caribbean Basin & Latin America; other US government funding of \$47,300; other funding of \$269,100
NPS	Pakistan	Natural Resources	Ongoing	Ongoing	101 sfc	Technical assistance & training; national/cultural heritage conservation & management technical assistance; wildlife conservation training; other funding of \$150,000

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NPS	Poland	Natural Resources	87/09	92/09	50 sfc	Cooperation & exchange; natural & cultural heritage conservation & management; personnel; information exchange
NPS	Spain	Natural Resources	84/05	88/05	5	Technical assistance; US-Spain Friendship Agreement; Spanish colonial archives research & inventory; other funding of \$85,000
NPS	Sri Lanka	Natural Resources	84/06	90/06		Training & technical assistance; Mahaweli protected area management; USAID funding of \$500,000
NPS	Thailand	Natural Resources	84/04	89/04	10	Training & technical assistance in national parks; USAID funding of \$53,000
NPS	USSR	Natural Resources	72/05	92/05	8	US-USSR Environmental Agreement; information exchange; professional delegation visits to each country; other funding of \$24,000
NRC	Belgium	Nuclear Safety	83/02	Indef	nb	Severe accident research
NRC	Belgium	Nuclear Safety	78/6	88/05		Information exchange
NRC	Belgium	Nuclear Safety	86/12	88/12	nb	Neutron dosimetry & neutron irradiation embrittlement

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AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NRC	Belgium	Nuclear Safety	85/07	90/07	nb	Thermal hydraulic research
NRC	Brazil	Nuclear Safety	82/01	87/01	nb	Information exchange; renewal being negotiated
NRC	Canada	Nuclear Safety	87/05	90/05	nb	Piping integrity research
NRC	Canada	Nuclear Safety	84/02	87/02	nb	Severe accident research; new agreement signed by NRC; awaiting signature by Canada
NRC	China	Nuclear Safety	86/10	91/10	nb	Information exchange
NRC	Denmark	Nuclear Safety	80/09	85/09	nb	Information exchange; renewal being negotiated
NRC	Egypt	Nuclear Safety	81/06	86/06	nb	Information exchange; renewal under negotiation
NRC	Finland	Nuclear Safety	85/09	90/09	nb	Information exchange
NRC	Finland	Nuclear Safety	85/02	88/02	nb	Thermal hydraulics & materials research. Extension under review
NRC	Finland	Nuclear Safety	84/09	89/09	nb	Information exchange
NRC	France	Nuclear Safety	83/06	88/06	nb	Fast breeder reactor safety research
NRC	France	Nuclear Safety	87/03	90/03	nb	Piping integrity research
NRC	France	Nuclear Safety	84/12	Indef	nb	Pressure tests to failure of a concrete containment model

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NRC	France	Nuclear Safety	86/09	91/09	nb	Thermal hydraulic research
NRC	France	Nuclear Safety	84/01	89/01	nb	Safety of radioactive waste management
NRC	France	Nuclear Safety	86/12	91/12	nb	LWR safety R&D
NRC	Germany, Fed Rep	Nuclear Safety	85/04	88/09	nb	Thermohydraulic behavior of emergency core cooling during the refill & reflood phase of a LOCA in a PWR
NRC	Germany, Fed Rep	Nuclear Safety	85/02	87/06	nb	Gundremmingen KRB-A reactor pressure vessel. Extension under negotiation
NRC	Germany, Fed Rep	Nuclear Safety	85/02	90/02	nb	Thermal hydraulic research
NRC	Germany, Fed Rep	Nuclear Safety	87/04	88/07	nb	Modification to the CONTAIN to include an exventing system model steam and/or water release from concrete & improved models for sodium concrete interactions
NRC	Germany, Fed Rep	Nuclear Safety	83/04	87/04	nb	Severe accident research; extension under review; new agreement under negotiation
NRC	Germany, Fed Rep	Nuclear Safety	84/09	89/09	nb	Nuclear safety research program at a high-temperature demonstration reactor facility
NRC	Germany, Fed Rep	Nuclear Safety	86/07	91/07	nb	Information exchange

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NRC	Germany, Fed Rep	Nuclear Safety	84/04	88/09	nb	SIMMER-II computer code transition phase phenomena
NRC	Germany, Fed Rep	Nuclear Safety	81/04	91/04	nb	Reactor safety research program
NRC	Germany, Fed Rep	Nuclear Safety	86/01	88/09	nb	Joint development of a prototype AFDM
NRC	Greece	Nuclear Safety	83/19	88/10	nb	Information exchange
NRC	Israel	Nuclear Safety	83/04	93/06	nb	Information exchange
NRC	Italy	Nuclear Safety	87/06	91/06	nb	Severe accident research
NRC	Italy	Nuclear Safety	86/01	91/01	nb	Thermal hydraulic research
NRC	Italy	Nuclear Safety	81/04	86/04	nb	Information exchange; renewal text is awaiting signature
NRC	Japan	Nuclear Safety	85/12	90/12	nb	Information exchange
NRC	Japan	Nuclear Safety	84/02	92/12	nb	ROSA IV safety research of LWR on small break LOCAs & transients
NRC	Japan	Nuclear Safety	86/09	89/09	nb	High-level vibration test of nuclear power plant piping
NRC	Japan	Nuclear Safety	84/11	89/11	nb	Radioactive waste management
NRC	Japan	Nuclear Safety	86/10	87/10	nb	AFDM prototype & CONTAIN computer code; one year extension under negotiation

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NRC	Japan	Nuclear Safety	87/05	91/05	nb	Severe fuel damage & fission product source term research
NRC	Japan	Nuclear Safety	84/12	88/09	nb	Contain 1.0 computer code for LMFBR containment analysis
NRC	Korea	Nuclear Safety	81/11	86/11		Information exchange; renewal under negotiation
NRC	Korea	Nuclear Safety	86/05	91/04	nb	Thermal hydraulic research
NRC	Korea	Nuclear Safety	84/08	90/08	nb	Severe accident research
NRC	Mexico	Nuclear Safety	81/04	86/04	nb	Information exchange; extension under review
NRC	Mexico	Nuclear Safety	87/06	92/06	nb	Nuclear safety research
NRC	Multilateral	Nuclear Safety	84/09	89/09	nb	EURATOM; nuclear safety research
NRC	Multilateral	Nuclear Safety	85/01	90/12	nb	OECD Halden Reactor project
NRC	Multilateral	Nuclear Safety	87/03	88/09	nb	EURATOM; joint development of a prototype advanced fluid dynamics model (AFDM); extension under consideration
NRC	Multilateral	Nuclear Safety	86/09	89/09	nb	OECD project on LOFT experimental program
NRC	Netherlands	Nuclear Safety	83/02	91/8	nb	Severe accident research

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NRC	Netherlands	Nuclear Safety	82/09	87/09	nb	Information exchange; agreement extension is awaiting signature
NRC	Philippines	Nuclear Safety	85/06	90/06	nb	Information exchange
NRC	Philippines	Nuclear Safety	85/08	90/08	nb	Thermal hydraulic research
NRC	Spain	Nuclear Safety	85/11	90/11	nb	Nuclear reactor safety
NRC	Spain	Nuclear Safety	84/09	89/09	nb	Information exchange
NRC	Sweden	Nuclear Safety	75/01	90/01	nb	Information exchange
NRC	Sweden	Nuclear Safety	87/03	90/03	nb	International piping integrity research
NRC	Sweden	Nuclear Safety	87/01	90/12	nb	Severe accident research
NRC	Sweden	Nuclear Safety	85/02	88/02	nb	Thermal hydraulics; extension under negotiation
NRC	Switzerland	Nuclear Safety	82/08	87/08	nb	Information exchange; renewal agreement is awaiting signature
NRC	Switzerland	Nuclear Safety	83/07	87/07	nb	Heavy section steel technology program & research program in fracture mechanics of the Swiss Federal Institute for Reactor Research; extension to be negotiated

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NRC	Switzerland	Nuclear Safety	86/09	91/09	nb	Radioactive waste management safety
NRC	Switzerland	Nuclear Safety	84/05	88/05	nb	Thermal hydraulic transients and ECCS REFLOOD program; extension being negotiated
NRC	Switzerland	Nuclear Safety	87/03	90/03	nb	International piping integrity research
NRC	Switzerland	Nuclear Safety	87/06	91/06	nb	Severe accident research
NRC	United Kingdom	Nuclear Safety	86/10	92/01	nb	Severe accident research
NRC	United Kingdom	Nuclear Safety	86/04	91/04	nb	Information exchange
NRC	United Kingdom	Nuclear Safety	85/02	90/02	nb	Modeling of loss of coolant accidents (LOCA)
NRC	United Kingdom	Nuclear Safety	84/08	87/08	nb	Studies by the systems reliability service; extension under review
NRC	United Kingdom	Nuclear Safety	82/08	92/08	nb	Nuclear safety R&D; new agreement under review
NRC	Yugoslavia	Nuclear Safety	85/09	90/09	nb	Information exchange
NSF	Argentina	Basic Sciences	72/08	92/08	190	Projects under S&T umbrella agreement; information and personnel exchanges; joint research; seminars, workshops, and meetings
NSF	Australia	Basic Sciences	68/10	90/10	244	Projects under S&T umbrella agreement; information and personnel exchanges; joint research; seminars workshops and meetings

ENTRY AGENCY	TERM- COUNTRY	SUBJECT AREA	INTO FORCE (Y/M)	INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NSF	Austria	Basic Sciences	84/02	89/02	67	Joint research; joint S&T education projects; visits exchange of personnel & information; meeting, seminar, & workshop support
NSF	Belgium	Basic Sciences	80/06	90/06	16	MOU involving personnel exchanges; joint seminars, workshops, & research
NSF	Brazil	Basic Sciences	72/09	89/02	178	Project under S&T umbrella agreement; information & personnel exchanges; joint research; seminars, workshops, & meetings
NSF	Brazil	Basic Sciences	86/09	Indef	32	S&T initiative signed by Presidents Sarney and Reagan; NSF has a lead role in basic sciences and engineering, and approx \$600,000 has been designated for NSF
NSF	Bulgaria	Basic Sciences	79/02	93/02	51	Joint research, seminars, & workshops; renewed in FY 1988
NSF	China	Basic Sciences	80/12	91/12	918	Protocol under S&T umbrella agreement; basic, applied, & social sciences
NSF	China	Earth Sciences	80/05	90/05	750	Protocol under S&T umbrella agreement; joint program with USGS

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NSF	Egypt	Basic Sciences	75/06	88/03		1983 MOU provides for activities carried out under the expiring umbrella S&T agreement, including information exchange & joint research; FY 1988 activities are minimal
NSF	Finland	Basic Sciences	86/04	91/04	24	Projects under the umbrella S&T agreement; prior MOU existed from 8/80-8/85; visits; personnel & staff exchanges; fellowships; joint research, seminars, & workshops
NSF	France	Basic Sciences	70/01	98/12	535	MOU for joint research & workshops
NSF	Hungary	Basic Sciences	72/07	91/07	344	Joint research, seminars, & workshops; covers all aspects of basic & applied natural & engineering sciences, social sciences, & math
NSF	India	Basic Sciences	83/10	91/10		S&T initiative signed by President Reagan & Prime Minister Gandhi; NSF serves as Executive Agent; FY 1988 extension will continue studies in agriculture, biomass, engineering and solid state sciences, and monsoon research, also explore new areas

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
NSF	India	Basic Sciences	75/01	Indef	495	Cooperative Science Program under the Indo-U.S. Subcommission on S&T; joint workshops; visits; supports attendance at international meetings; information & data exchanges; translation services
NSF	Israel	Basic Sciences	72/09	90/05	24	Most activities under BSF program; MOU signed by NCRD/NSF 5/85 for personnel & information exchanges in basic & applied sciences; program presently is supporting annual workshops on subjects of mutual interest to the science communities
NSF	Italy	Basic Sciences	87/06	91/06	213	Projects under S&T umbrella agreement (NSF was Executive Agency thru 6/86); MOU provides for joint research, seminars & workshops; information & personnel exchanges; installation utilization; training; intellectual property rights
NSF	Japan	Basic Sciences	61/06	Indef	661	Projects under Joint Communique issued by President Kennedy & Prime Minister Hayato Ikeda; joint research & seminars; collaborative research visits

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AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
NSF	Japan	Energy	81/09	89/09	75	Protocol on photosynthesis & photoconversion under umbrella energy agreement with NSF & DOE as co-implementing agencies
NSF	Korea	Basic Sciences	77/05	92/05	267	NSF-KOSEF MOU under S&T umbrella agreement; joint research, seminars, & workshops; long-term joint research visits; short-term project development visits; annual seminar identifies joint priorities
NSF	Mexico	Basic Sciences	72/06	Indef	139	Projects under S&T umbrella agreement; information & personnel exchanges; joint research; seminars, workshops, & meetings
NSF	New Zealand	Basic Sciences	74/02	89/02	96	Projects under S&T umbrella agreement; joint research; information & personnel exchanges; utilization of installations
NSF	Pakistan	Basic Sciences	81/03	89/05	432	Cooperative Science Program MOU with the Pakistan Ministry of S&T; joint research, seminars & workshops; visits; supports attendance at international meetings; information & data exchanges; translation services

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
NSF	Pakistan	Basic Sciences	82/12	Indef		Cooperative Science Program under the U.S.-Pakistan Subcommittee on S&T; limited activity during FY 1988
NSF	Poland	Basic Sciences	88/06	93/06		MOU under the new S&T umbrella agreement provides for joint research, seminars and workshops
NSF	Romania	Basic Sciences	79/02	88/02		Joint workshops & seminars; short-term project development visits; joint research. Renewal pending
NSF	Saudi Arabia	Basic Sciences	79/06	89/10	574	"Umbrella" project agreement in conjunction with the U.S. Treasury Dept; institutional development; development of a national S&T information system, grants program & a national research institute; science education
NSF	Spain	Basic Sciences	70/07	88/05	350	Projects under Agreement of Friendship, Defense & Cooperation; joint research, seminars & workshops; lack of funding caused a temporary hold on projects during FY 1987. These awards pending under the program were funded in FY 1988. The program is now closed

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
NSF	Sweden	Basic Sciences	81/10	89/10	136	Letter of Agreement for joint research, seminars, workshops & scientific exchanges with the National Science Research Council of Sweden
NSF	Switzerland	Basic Sciences	78/11	88/11	104	Visits, personnel exchanges & fellowships; joint seminars, workshops & research
NSF	Turkey	Basic Sciences	83/06	88/10	76	MOU under S&T umbrella agreement provides for joint research, seminars. In Fy 1988 NSF and Tubitak (National Council for S&T) of Turkey reached agreement on cooperative program in earthquake engineering
NSF	United Kingdom	Basic Sciences	80/05	Indef	178	Exchange of letters with no formal agreement; joint workshops & research; long-term research visits
NSF	Venezuela	Basic Sciences	83/07	88/07	24	Projects under S&T umbrella agreement; information & personnel exchanges; joint research, seminars, workshops, & meetings

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
NSF	Yugoslavia	Basic Sciences	80/06	Indef		Projects under S&T umbrella agreement; Joint Board provides support in US dollars & Yugoslav dinars from Joint Fund; joint research; short-term visits
NTIS	China	S&T Information	84/04	89/04	25	Reciprocal exchange of S&T report literature & facilities in the use of available information systems & databases
US Gov	Argentina	S&T Umbrella	72/08	Indef		Agreement for scientific & technical cooperation; individual cooperating agencies negotiate funding with counterpart agencies
US Gov	Australia	S&T Umbrella	68/10	90/10		Agreement relating to scientific & technical cooperation; individual cooperating agencies negotiate funding with counterpart agencies
US Gov	Brazil	S&T Umbrella	71/12	90/04	2,000	The agreement is awaiting reorganization by an experts' panel formed under the Presidential S&T Initiative of 09/86

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AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
US Gov	China	S&T Umbrella	79/01	89/01		Agreement established U.S.-PRC Joint Commission on S&T Cooperation; 29 protocols in all fields of science, technology & education; individual cooperating agencies negotiate funding with counterpart agencies
US Gov	Egypt	S&T Umbrella	81/11	91/11		Agreement relating to cooperation in the areas of science & technology
US Gov	Finland	S&T Umbrella	85/09	90/09		Agreement on cooperation in science & technology; agreement contains an Intellectual Property Annex for protection of copyrights, patents, other intellectual property; individual cooperating agencies negotiate funding with counterpart agencies
US Gov	Hungary	S&T Umbrella	77/07	92/07		S&T is a subset of overall agreement for cooperation in culture, education, science & technology

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
US Gov	India	S&T Umbrella	83/10	91/10		Agreement by President Reagan & Prime Minister Gandhi to launch the Science & Technology initiative (STI) on 7/28/82; initiative implemented Oct. 83; renewed for 3 years Oct 85 and Oct 88; covers the fields of health, agriculture, monsoons
US Gov	Indonesia	S&T Umbrella	79/10	89/10		Agreement on cooperation in scientific research & technological development; individual cooperating agencies negotiate funding with counterpart agencies
US Gov	Israel	S&T Umbrella	77/10	Indef		Agreement to establish the Binational Industrial Research & Development Foundation (BIRDF); US & Israel contributed equally to a \$110 million endowment; interest earnings are used to fund joint venture projects between US and Israeli companies. Agreement also establishes the Binational Agricultural Research and Development Fund (BARD). US and Israel contributed equally to a \$110 million endowment. Interest earnings are used to fund joint agricultural research projects

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
US Gov	Italy	S&T Umbrella	88/04	93/04		Agreement for scientific & technological cooperation; agreement contains intellectual property provisions; individual cooperating agencies negotiate funding with counterpart agencies
US Gov	Japan	S&T Umbrella	79/05	89/05		Agreement on cooperation in research & development in energy & related fields
US Gov	Japan	S&T Umbrella	88/06	93/06		Agreement on cooperation & development in science & technology; negotiations currently underway on renewal of the agreement; joint R&D in all areas of S&T, except energy, and cooperation in developing S&T policies of the two countries; individual cooperating agencies negotiate funding with counterpart agencies
US Gov	Korea	S&T Umbrella	76/05	88/10		Agreement relating to scientific & technical cooperation; negotiations currently underway on renewal of the agreement; individual cooperating agencies negotiate funding with counterpart agencies

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
US Gov	Mexico	S&T Umbrella	72/06	Indef		Agreement for scientific & technical cooperation; individual cooperating agencies negotiate funding with counterpart agencies; restructuring of bilateral mixed commission in 1988 to deal with policy and coordination issues only
US Gov	New Zealand	S&T Umbrella	74/02	89/02		Agreement for scientific & technological cooperation; individual cooperating agencies negotiate funding with counterpart agencies
US Gov	Pakistan	S&T Umbrella	82/12	Indef		Agreement to establish a Joint Commission on economic, commercial, scientific, technological, educational & cultural cooperation
US Gov	Poland	S&T Umbrella	87/09	92/09		Agreement established a joint commission and a joint fund with contributions from both sides after lapse of an earlier agreement signed in 1972; extensive language on protection of intellectual property
US Gov	Senegal	S&T Umbrella	82/08	87/08		Agreement for scientific & technological cooperation

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
US Gov	Spain	S&T Umbrella	84/05	88/05	nak	The US-Spain Agreement of Friendship, Defense & Cooperation under which a Complementary Agreement on Culture & Education and Science & Technology functions, expired May 1988; rights and obligations continue for 1 year; \$1.75 million in FY88 ESF funds were allocated to Spain for purpose of completing ongoing projects & terminating all activities; approximately \$5.5 million from previous years' allocations remain; US & Spanish negotiators of new security agreement have agreed that a new S&T/C&E agreement should be negotiated at the same time; clearance on language proceeding
US Gov	Sri Lanka	S&T Umbrella	84/06	90/06		Agreement on cooperation in science & technology
US Gov	Thailand	S&T Umbrella	84/04	89/04		Agreement on cooperation in science & technology; individual cooperating agencies negotiate funding with counterpart agencies

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AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
US Gov	Turkey	S&T Umbrella	83/10	88/10		Agreement for scientific & technological cooperation; formal consideration of a new agreement is in process; currently there is minimal activity under the agreement; individual cooperating agencies negotiate funding with counterpart agencies
US Gov	Venezuela	S&T Umbrella	83/07	88/07		Agreement for scientific & technological cooperation; individual cooperating agencies negotiate funding with counterpart agencies
US Gov	Yugoslavia	S&T Umbrella	88/06	93/06		Agreement on scientific & technological cooperation; US funding is \$10 million over a 5-year period, and this is matched in local currency by the Yugoslavs; project funding is governed through the Joint Board from the Joint Fund
USDA	Algeria	Agricultural Science	84/02	89/02	2	Plant materials for dry land coverage exchanged
USDA	Argentina	Agricultural Science	81/05	86/11	2	Identify existing gaps in data bank needed to compare production costs and forest products trade potential

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
USDA	Australia	Agricultural Science	82/02	Indef	48	Agricultural R&D; soil and water conservation, industrial utilization
USDA	China	Agricultural Science	79/06	91/04	100	Agricultural R&D under umbrella S&T agreement; exchange of soybean germplasm; comparison of import/export. Negotiations for livestock; corn disease research; watershed management
USDA	France	Agricultural Science	87/03	92/03	50	Agricultural S&T; forestry reproductive biology of the Meishan pig; comparison of remote sensing data for agricultural use
USDA	Germany, Fed Rep	Agracultural Science	81/03	ev.5 yrs	35	Effect of distribution on forest and crops human nutrition and food technology, plant protection
USDA	Greece	Agricultural Science	81/06	Indef	5	Germplasm exchange
USDA	Ireland	Agricultural Science	Pending		40	A forage/livestock management, extension food technology

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AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
USDA	Japan	Agricultural Science	80/05	87/10	12	Agricultural S&T under the non-energy umbrella S&T agreement; greenhouse technology; forestry; final agreement on continuing & new projects is awaiting agreement on intellectual property protection in the umbrella agreement
USDA	Mexico	Agricultural Science	83/12	87/10	16	Agricultural R&D; plant genetic research; screwworm research; pine beetles seminar; nutrition seminar; distributed watershed modeling
USDA	Netherlands	Agricultural Science	85/11	90/11	20	Agricultural S&T; market and policy economic research; soil and water science; integrated pest management
USDA	New Zealand	Agricultural Science	83/11	88/11	2	Agricultural R&D; tree improvement; animal diseases surveillance systems
USDA	Philippines	Agricultural Science	88/02	93/02	3	Agricultural S&T; cocoa production technology
USDA	Thailand	Agricultural Science	84/06	89/06	12	Agricultural development; human nutrition; soil conservation techniques; post-harvest techniques for tropical fruits and vegetables

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
USDA	Turkey	Agricultural Science	85/11	90/04	4	Agricultural S&T; joint activities FY 1988 included the First World Walnut Conference
USDA	USSR	Agricultural Science	73/06	Indef	2	Agricultural S&T; joint Working Group met in Washington in 09/87; joint committee met in Washington in 01/88. Six U.S. teams to USSR in FY 1988
USDA	Venezuela	Agricultural Science	83/07	88/07	18	Joint studies on vampire bats & cattle performance
USDA	Yugoslavia	Agricultural Science	80/06	Indef		Joint agricultural S&T, in part funded through the US-Yugoslav Joint Board; livestock & crop management; control of livestock diseases; biologic control of pests
USDA	Zimbabwe	Agricultural Science				Joint Agricultural Working Group Meeting held in Washington

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
USGS	Argentina	Earth Sciences	87/01	88/12		Pilot project investigating use of satellite images for mapping; funding of \$15,000 in FY 1988 provided by the Pan American Institute of Geography & History. Phase I completed Apr. 1988. Image map at 1:50,000 scale of Viedma area printed.
USGS	Bangladesh	Earth Sciences	82/05	90/06		7 year, \$1.5 million program funded by Asian Development Bank for institution building of Geological Survey of Bangladesh, including 98 man-months of USGS consultants & \$900,000 for on-the-job training of GSB personnel in the U.S.; about 17 man-months in FY 1988 funded at \$300,000
USGS	Bolivia	Earth Sciences	88/01	89/12		Evaluation of SPOT/Landsat images for change detection and map revision at 1:50,000 scale; funding of \$14,000 in FY 88 provided by DMA Inter-American Geodetic Survey in support of PAIGH Commission on cartography project

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
USGS	Canada	Earth Sciences	81/04	91/04	200	Joint marine, geophysical, & water resources research; ore deposit modeling; platinum group element projects; Great Lakes seismic studies; Arctic research; mapping data exchange; international strategic minerals inventory
USGS	Canada	Earth Sciences	85/01	90/12	30	Atmospheric deposition; standardization of monitoring equipment & procedures; Canada provides estimated \$30,000 in funding
USGS	Chile	Earth Sciences	87/04	90/04		Seismic zoning & implementation of improved earthquake resistant designs; funded by AID/OFDA at \$70,000
USGS	China	Earth Sciences	80/01	90/01	50	Surface Water Hydrology Protocol; joint research in sediment transport, hydrologic extremes, hydrologic measurement procedures, instruments & equipment; exchange of hydrologic data & analysis techniques; PRC provides funding estimated at \$50,000

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
USGS	China	Earth Sciences	80/01	90/01	130	Earth Science Protocol; PRC provides \$26,500 funding; joint research on pyrophyllite deposits; geochemical anomalies in Xinjiang and southwestern U.S.; genetic and descriptive model of Bayan Obo iron-niobium-rare earth deposit, Inner Mongolia, China; and southern China and western U.S. granitoid rocks
USGS	China	Earth Sciences	85/01	90/12	200	Survey & Mapping Protocol; joint projects in the cartographic applications of remote sensing & in the development of geographic information systems in cooperation with the Defense Mapping Agency & National Geodetic Survey
USGS	China	Earth Sciences	84/07	90/01	103	Earthquake Studies Protocol; PRC provides \$264,000 funding; studies on deep crustal structures in fault zones; premonitory phenomena; crustal stress measurements; seismic networks; rock mechanics; intraplate active fault studies

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
USGS	Dominican Republic	Earth Sciences	88/03	88/03	5	Multidisciplinary investigation into the biochemical corrosion of gates of the Sabana Yegua reservoir. USAID funded at \$13,000
USGS	El Salvador	Earth Sciences	80/04	89/04	1	Hazard assessment program; evaluation of seismic hazards; development of seismic risk map; funded by USAID at \$80,000
USGS	France	Earth Sciences	85/07	91/07	123	Joint studies in water resources research, radioactive waste, oceanographic research, geochemistry research, mineral deposits, geophysics, & sea-ice research & remote sensing in polar regions; \$15,000 Gov't of France & other funding
USGS	Germany, Fed Rep	Earth Sciences	75/07	93/07	20	Joint research in marine seismology, radioactive wastes, petroleum resource assessment & Antarctic studies; sea-ice studies, marine minerals; international strategic minerals inventory

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
USGS	Hungary	Earth Sciences	86/01	89/07		Assessment of petroleum resource potential in the Pannonian Basin of Hungary; funded by the World Bank at \$360,000
USGS	Hungary	Earth Sciences	82/03	92/02	10	Cooperative geophysical research projects
USGS	Iceland	Earth Sciences	82/04	90/04	80	Agreement in cooperation with the National Research Council; information & personnel exchanges; joint research in geophysical, geological, & hydrological phenomena
USGS	India	Earth Sciences	75/01	Indef.	10	U.S.-India fund provides about \$30,000; multidisciplinary workshops & identification of other mutually beneficial joint research projects
USGS	Indonesia	Earth Sciences	87/01	Indef	62	Peat studies as modern analogs to U.S. coal fields; field visit to Kalimantan
USGS	Indonesia	Earth Sciences	86/02	90/06		Five year marine geology program funded by the Asian Development Bank at \$1 million; project provides for a resident team leader & 10 TDYs for 2.5 man-months each. In FY 88 funded at \$529,000

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
USGS	Indonesia	Earth Sciences	84/04	88/08		research Volcano Monitoring & ROPDA at Program; funded by AIDeam \$165,000; residential leader and 6 TDYs
USGS	Italy	Earth Sciences	85/04	88/01		ake Southern Italy Earthqu Reconstruction Program upgrade of seismic/voly program to improve ear warning capability for volcanic eruption in t Flegrei region; funded USAID at \$75,000
USGS	Italy	Earth Sciences	81/07	87/12	24	umbrella Program under the S&T & agreement; development installation of digit real-time seismograph hydrological hazards development of new te \$74,000 GOI & other
USGS	Japan	Earth Sciences	88/08	88/09	19	Debris flow research; experimental studies bedform alignment rel sediment transport st continental shelves estuaries. Japan prov approximately \$6,300

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
USGS	Japan	Earth Sciences	85/02	93/02	17	Joint research on deeply buried mineral deposits and gold deposits; Geological Survey of Japan provides funding of \$6,000
USGS	Jordan	Earth Sciences	82/09	89/12		Seismic network program, remote sensing; funded by USAID AT \$179,000
USGS	Korea	Earth Sciences	87/01	89/12		Sedimentary basin analysis program; Korea Institute for Energy & Resources provides funding for USGS travel
USGS	Mexico	Earth Sciences	79/01	88/12		Cooperative Border Mapping Agreement funded by the International Boundary and Water Commission, USGS & the US Customs Service at \$390,000; production & distribution of color image maps by the U.S.; border photography by Direction General de Geografia de Mexico, plus review editing by the International Boundary and Water Commission & the Customs Service

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
USGS	Multilateral	Earth Sciences	88/03	88/03		Workshop on potential economic impact of earthquake hazards throughout the world sponsored by AID/OFDA, held in Washington, D.C. March 8-9, 1988. Funded by OFDA at \$50,000
USGS	Multilateral	Earth Sciences	88/09	88/09	14	Mineral Deposit Modeling Workshop on Epithermal Gold-Silver Deposits Bolivia
USGS	Multilateral	Earth Sciences	86/10	Indef		Mineral deposit evaluation for the Pacific Trust Territories; resource assessment work on Guam and Saipan; funded by DOI at \$82,000
USGS	Multilateral	Earth Sciences	74/01	Indef	273	Circum-Pacific Map Project; coordination & cartographic preparations of about 60 thematic maps

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AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
USGS	Multilateral	Earth Sciences	88/01	88/12		USGS provides technical expertise to UN agencies as requested. In FY 1988: spectrographic analysis (Guayana); geothermal feasibility (Honduras); mineral resources study (Mozambique) marine geophysics (PRC); seismology field investigations (Peru); water resources information systems and ground-water data study (India). UN agencies provided \$107,000
USGS	Multilateral	Earth Sciences	88/01	Indef	60	Int. Strategic Minerals Inventory; Global Inventory of Strategic Commodities including cobalt, nickel, platinum and titanium
USGS	Multilateral	Earth Sciences	74/01	Indef	50	Advisory coordination & training in the southwest and western Pacific; coastal geological hazards & resources; one USGS employee in residence in Fiji; USAID provides approximately \$8,000 in funding

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
USGS	Multilateral	Earth Sciences	86/08	91/07		Interagency Volcano Early Warning Disaster Assistance Program funded by USAID/IFDA and AID/Guatemala at \$2,000; provides for emergency response to volcano crises
USGS	Multilateral	Earth Sciences	72/01	Indef		Antarctic ice cap motion studies; seismology investigations and data telecommunications at the South pole. Funding of \$150,000 by DMA
USGS	Multilateral	Earth Sciences	88/04	88/07		Identify remote sensing data requirements for AGRHYMET agricultural assessments in 9 west African countries. AID funding of \$120,000
USGS	Multilateral	Earth Sciences	82/09	88/09	5	Offshore exploration for petroleum resources in the southwest Pacific
USGS	Multilateral	Earth Sciences	87/03	88/12		Famine Early Warning System (FEWS) Program; Application of Geographic Information System (GIS) to target populations at risk of famine in 8 sub-Saharan countries. AID funding of \$300,000

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
USGS	Multilateral	Earth Sciences	86/01	Indef	40	Advisory consultations to intergovernmental geoscience bodies in e astern Asia, particularly in resource assessment methodologies; preparation of regional base maps at 1:2,000,000-scale; about \$5,000 in travel funds from the U.S. Department of State and \$5,000 from the International Union of Geological Sciences
USGS	Multilateral	Earth Sciences	66/01	Indef		Acquisition of geodetic data; aerial photography; satellite imagery and production of maps; Operation of the Scientific Committee on maps; Operation of the Scientific Committee on Antarctic Research (SCAR) Library for Cartography & Geodesy. Funding at \$303,000 provided by the National Science Foundation
USGS	Multilateral	Earth Sciences	87/10	88/02	13	Low frequency ice radar experiments in Antarctica. NSF funding at \$3,000
USGS	Multilateral	Earth Sciences	87/04	88/12	12	Grasshopper and locust habitat identification and monitoring in Chad, Mali, Mauritania, Niger, and Sudan. AID funding of \$270,000

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
USGS	Multilateral	Earth Sciences	87/11	88/02	44	Field research at lakes in dry valleys related to global carbon cycle in Antarctica. NSF funding at \$8,000
USGS	Multilateral	Earth Sciences	84/01	88/05		Comparative earthquake & tsunami potential for zones in the Circum-Pacific region; funded by USAID at \$55,000
USGS	Multilateral	Earth Sciences	88/03	88/03	23	Marine geology course and workshop sponsored by USGS and Gov't of Chile, March 3-19, 1988. Funded by GOC at \$13,000. Mineral Deposit Modeling Workshop held in Chile 11/5-20/87, UNESCO funded \$2,400
USGS	New Zealand	Earth Sciences	86/01	90/12		Joint USGS-New Zealand project to do 1:50,000 scale mapping of regions of high scientific interest in McMurdo Sound area of Antarctica; funded by NSF at \$50,000. USGS completed its work on the first 5 sheets which were sent to New Zealand for compilation

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
USGS	Norway		88/05	88/09	17	Study soil genesis and weathering to assess hydrochemical weathering variations in watershed ⁹ . P.L. 87-256 (Fulbright-S. Hayes funded at \$7,000)
USGS	Norway	Earth Sciences	87/01	88/12	150	Joint research project develop methods for proto digital sonar image data processing Gov't of Norway funds fa. personnel participating in the project
USGS	Pakistan	Energy	85/08	89/07		Four-year \$5 million program for coal resources exploration & assessment, national exploration plan, coal coal analytical lab. system, geodata center, and institutional modernization Geological Survey of Pakistan of In FY 88 funded at \$49 million by USAID 6,600
USGS	Panama	Earth Sciences	86/08	89/07		Earthquake hazards mitigation program; funded by AID \$47,000 /OPDA at
USGS	Papua New Guinea	Earth Sciences	84/01	Indef	8	Mineral resource assessment program; Geological Survey of Papua New Guinea providing travel funds for USGS design consultants

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
USGS	Portugal	Earth Sciences	87/04	92/04	32	Funded by the LUSO-American Foundation for \$43,000; massive sulfide deposit studies in the Iberian Pyrite Belt during 1986-1989
USGS	Saudi Arabia	Earth Sciences	63/01	90/12		Establishment of an earth sciences organization with staff, facilities, & procedures development; geographic & geologic cartography; mining; geologic, geochemical & geophysical studies; geologic & mineral resources database; \$4.8 million from Saudi Arabia in FY 1988
USGS	Spain	Earth Sciences	70/07	Indef	75	Projects under the Agreement of Friendship with funding of \$64,000; 8 projects in water geochemistry & flow systems, remote sensing for mineral deposits, earthquake research, marine geology of continental margins, water resources/pollution management, gold resources, mercury resources & hydrochemical studies in the Canary Islands

AGENCY	COUNTRY	SUBJECT AREA	RY ENT O INT CE FOR M (Y/ M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
USGS	USSR	Earth Sciences	72/ 01	Indef	130	USSR, DOE & DOD funding of \$124,600; joint projects in predicting earthquakes, estimating seismic risk & understanding seismic sources; studies on marine mineral resources; climate change; Joint Verification Experiment and nuclear testing talks for exchange of geologic data and discussions on expanded cooperation.
USGS	United Arab Emirates	Earth Sciences	88 /02	92/02		An assessment of the ground-water resources of Abu-Dhabi; funded by Abu Dhabi Emirate at \$6 million. In FY 1988 funded at \$200,000
USGS	United Kingdom	Earth Sciences	85 /01	88/12		Joint USGS/NOAA/U.K. remote sensing image mapping project of Antarctica at 1:5 million scale; funded by NSF at \$20,000. UK has completed digital image processing; USGS is evaluating the data and preparing plans to print the product
USGS	United Kingdom	Earth Sciences	8 4/01 I-116	89/12	4,500	Seafloor sonar imaging surveys using the Geologic Long-Range Inclined Asdic (GLORIA) system

AGENCY	COUNTRY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ x 1000)	REMARKS
USGS	Venezuela	Earth Sciences	87/02	92/02		Geologic mapping & mineral resources assessment of the Guyana shield; funding provided by Venezuela at \$279,000
USGS	Venezuela	Earth Sciences	88/06	88/07	4	Examine processes controlling erosion rates and the composition of sediments in the Orinoco River. NSF funding at \$5,500
USGS	Yugoslavia	Earth Sciences	80/06	Indef	13	Projects under the S&T umbrella agreement; Joint Fund provides \$25,000 for 7 projects in agogeology, seismic research, geochemical exploration methods, coal resources, granite metamorphic complexes & remote sensing and water and soil sampling

APPENDIX II

DATABASE II

SUMMARY OF U.S. INTERNATIONAL
S&T AGREEMENTS:
BY COUNTRY

Explanation of Database and Footnotes

The information in the following database is intended to provide an overview of international cooperative activities in science and technology between government agencies of the United States and their counterpart agencies in other countries. For the most part, the items listed in the database are at the Memorandum of Understanding (MOU) level or higher; information also is provided on some large project agreements and contractual arrangements.

COUNTRY designates the cooperating foreign nation. "Multilateral" and "Regional" are used for agreements signed with more than one country that are essentially identical agreements in a single area of cooperation.

AGENCY generally designates the United States agency that is the lead agency for the agreement.

SUBJECT AREA designates the broad area of cooperation.

ENTRY INTO FORCE (Y/M) and TERMINATION DATE (Y/M) indicates the duration of the agreement. Agreements that have been renewed without significant changes frequently show the initial date of entry into force. "Indef" generally indicates an agreement with an indeterminate duration; it may extend until the cooperative activities are completed or until funds are depleted, or it may be an agreement that renews automatically unless terminated by mutual written consent. "Variable" is used for regional agreements, indicating that some of the agreements were initiated and terminated on different dates.

FUNDING lists FY 1988 agency funding when it is available. The figures are presented in thousands of U.S. dollars. Footnotes apply to funding information. The following footnotes are utilized:

- cr = cost reimbursable cooperation;
- nb = no specific budget item;
- rmk = see REMARKS column for funding information;
- sic = funding provided from special foreign currency account.

REMARKS provides specific details on cooperative activities, funding information, and other information.

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Algeria	USDA	Agricultural Science	84/02	89/02	2	Plant materials for dry land coverage exchanged
Argentina	NOAA	Space Technologies	84/09	Indef		MOU for direct reception & distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 & Landsat-5
Argentina	NSF	Basic Sciences	72/08	92/08	190	Projects under S&T umbrella agreement; information and personnel exchanges; joint research; seminars, workshops, and meetings
Argentina	US Gov	S&T Umbrella	72/08	Indef		Agreement for scientific & technical cooperation; individual cooperating agencies negotiate funding with counterpart agencies
Argentina	USDA	Agricultural Science	81/05	86/11	2	Identify existing gaps in data bank needed to compare production costs and forest products trade potential

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Australia	HHS	Food & Drug Reg.	79/11	Indef		FDA MOU; shellfish sanitation & certification for export to the U.S.; annual inspection of growing area & processing facilities; inactive due to no shipping
Australia	NASA	Space & Aeronautics	84/10	89/10		Balloon launches within Australia
Australia	NASA	Space & Aeronautics	87/09	97/08		Sounding rocket launches from Australian territory
Australia	NASA	Space & Aeronautics	85/07	90/07	nb	Long-duration balloon agreements
Australia	NASA	Space & Aeronautics	81/07	90/02	nb	Establishment of tracking stations in Australia
Australia	NOAA	Space Technologies	84/03	Indef		MOU for direct reception & distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 & Landsat-5
Australia	NSF	Basic Sciences	68/10	90/10	244	Projects under S&T umbrella agreement; information and personnel exchanges; joint research; seminars workshops and meetings

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Australia	US Gov	S&T Umbrella	68/10	90/10		Agreement relating to scientific & technical cooperation; individual cooperating agencies negotiate funding with counterpart agencies
Australia	USDA	Agricultural Science	82/02	Indef	48	Agricultural R&D; soil and water conservation, industrial utilization
Austria	HHS	Biomedical Sciences	87/04	92/04	10	Agreement between NIH & Austrian Science Foundation for the support of biomedical scientist exchanges
Austria	NSF	Basic Sciences	84/02	89/02	67	Joint research; joint S&T education projects; visits; exchange of personnel & information; meeting, seminar, & workshop support
Bangladesh	USGS	Earth Sciences	82/05	90/06		7 year, \$1.5 million program funded by Asian Development Bank for institution building of Geological Survey of Bangladesh, including 98 man-months of USGS consultants & \$900,000 for on-the-job training of GSB personnel in the U.S.; about 17 man-months in FY 1988 funded at \$300,000

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Argentina	USGS	Earth Sciences	87/01	88/12		Pilot project investigating use of satellite images for mapping; funding of \$15,000 in FY 1988 provided by the Pan American Institute of Geography & History. Phase I completed Apr. 1988. Image map at 1:50,000 scale of Viedma area printed.
Australia	DOE	Energy (Renewable)	88/06	98/04		Exchange of information on alternate fuels, particularly transport fuels
Australia	DOT	Transportation	68/10	90/10	nb	Projects and technical exchanges carried out under the US-Australia S&T Agreement. Interests are primarily aviation, urban innovations, and highway/traffic safety
Australia	HHS	Biomedical Sciences	76/08	Indef		NIH/National Library of Medicine MEDLARS Agreement with National Library of Australia; quid pro quo interlibrary exchange
Australia	HHS	Food & Drug Reg.	86/08	Indef		FDA MOU; dry milk products for certification for export to the U.S.

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Belgium	DOE	Energy (Rad.Waste)	81/01	89/01		Exchange of technology in radioactive waste management to include geological storage technology and waste processing technology
Belgium	HHS	Biomedical Sciences	84/02	Indef		NIH agreement with the Belgian National Fund for Support of Research (FNRS) to obtain funding for Belgian scientists to work in U.S. laboratories
Belgium	HHS	Food & Drug Reg.	74/12	Indef		MOU; FDA recognizes certificate of analysis from government authorities of dry milk products
Belgium	NRC	Nuclear Safety	83/02	Indef	nb	Severe accident research
Belgium	NRC	Nuclear Safety	78/6	88/05		Information exchange
Belgium	NRC	Nuclear Safety	86/12	88/12	nb	Neutron dosimetry & neutron irradiation embrittlement
Belgium	NRC	Nuclear Safety	85/07	90/07	nb	Thermal hydraulic research
Belgium	NSF	Basic Sciences	80/06	90/06	16	MOU involving personnel exchanges; joint seminars, workshops, & research

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Bolivia	USGS	Earth Sciences	88/01	89/12		Evaluation of SPOT/Landsat images for change detection and map revision at 1:50,000 scale; funding of \$14,000 in FY 88 provided by DMA Inter-American Geodetic Survey in support of PAIGH Commission on cartography project
Brazil	BReclam	Natural Resources	86/11	89/11		Land & water resources institution building; advisory assistance to Ministry of Irrigation on expanding irrigated agriculture in northern Brazil; World Bank funding of \$1.2 million
Brazil	DOE	Energy (fossil)	84/05	99/00		Analysis of feasibility of exploitation of Brazilian coal
Brazil	DOT	Transportation	84/03	Indef	nb	Identified areas for cooperation: civil aviation; urban mass transit; vehicle fuel conservation & lternative fuel technology
Brazil	EPA	Environment	86/10	90/12		Agreement to provide technical assistance to CETESB, Sao Paulo state pollution control agency; formal agreement pending

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Brazil	HHS	Biomedical Sciences	77/01	Indef		NIH/National Library of Medicine MEDLARS Agreement with Centro Latino-Americano de Informacao em Ciencias de Saude (BIREME); quid pro quo interlibrary exchanges
Brazil	NOAA	Space Technologies	84/05	Indef		MOU for direct reception & distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 & Landsat-5
Brazil	NRC	Nuclear Safety	82/01	87/01	nb	Information exchange; renewal being negotiated
Brazil	NSF	Basic Sciences	86/09	Indef	600	S&T initiative signed by Presidents Sarney and Reagan; NSF has a lead role in basic sciences and engineering, and approx \$600,000 has been designated for NSF
Brazil	NSF	Basic Sciences	72/09	89/02	145	Project under S&T umbrella agreement; information & personnel exchanges; joint research; seminars, workshops, & meetings
Brazil	US Gov	S&T Umbrella	71/12	90/04	2000	The agreement is awaiting reorganization by an experts' panel formed under the Presidential S&T Initiative of 09/86

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Bulgaria	HHS	Biomedical Sciences	86/11	89/11		Agreement between NIH and Bulgarian Medical Academy for support of biomedical scientist exchanges under the umbrella U.S.-Bulgaria Exchanges Agreement
Bulgaria	NOAA	Fisheries	77/02	88/07		Governing International Fishery Agreements established on a bilateral basis, conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. Exclusive Economic Zone
Bulgaria	NSF	Basic Sciences	79/02	93/02	51	Joint research, seminars, & workshops; renewed in FY 1988
Burma	NPS	Natural Resources	87/03	Indef	301 sfc	Technical assistance in conservation, resource management, & protected areas management; other funding of \$23,000

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Canada	Census	Statistics	86/03	91/03		This MOU recognizes long-standing informal cooperation and provides for its continuation, specifically including exchange visits, joint study and research and, in an important annex, a joint project to reconcile trade statistics which also includes the customs organizations of the two governments
Canada	DOE	Energy	86/12	96/12		General bilateral agreement for the purpose of establishing wider cooperation in the field of energy research & development
Canada	DOE	Energy (Fossil)	79/06	89/12		Cooperation in R&D activities having to do with tar sands & heavy oil extraction, processing & related technologies
Canada	DOE	Energy (Fossil)	88/02	98/02		Establish a framework for collaboration in the field of natural gas hydrates
Canada	DOE	Energy (Fusion)	87/11	92/11		Finding solutions to mutually agreed upon problems associated with the development of magnetic fusion as a source of energy

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Canada	DOE	Energy (Nuclear)	82/08	92/08		Cooperation in various phases of radioactive waste management storage & processing technology
Canada	DOT	Transportation	70/06	Indef	nb	Urban systems; rail research; marine transport research; aeronautics; traffic & vehicle safety; highway research; systems for disabled; and R&D on broad aspects of transport systems
Canada	EPA	Environment	72/06	Indef	nb	US-Canadian governmental agreement for restoration & maintenance of the chemical, physical & biological integrity of the waters of the Great Lakes Basin ecosystem
Canada	EPA	Environment	85/10	Indef	nb	A second MOU outlines a plan of cooperative measures for dealing with accidental releases of pollutants which cause, or may cause, damage along the border & constitute a threat to public health, property or welfare; a Joint Contingency Plan is being developed

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Canada	EPA	Environment	85/10	Indef	nb	MOU between EPA & Environment Canada includes pollution measurement & control, R&D & improved technologies & systems for pollution control
Canada	EPA	Environment	85/11	Indef	nb	Third MOU provides for export, import & transit of hazardous wastes across the boundary for treatment, storage or disposal
Canada	HHS	Biomedical Sciences	70/01	Indef		NIH/National Library of Medicine. MEDLARS Agreement with Canada Institute for Scientific & Technical Information (CISTI); quid pro quo interlibrary exchange
Canada	HHS	Food & Drug Reg	88/06	93/06		FDA MOU with Medical Service Branch, Department of National Health & Welfare; monitor food, beverages & sanitary services provided on common carriers between Canada & U.S.
Canada	HHS	Food & Drug Reg.	79/05	Indef		FDA MOU with Health Protection Branch, Department of National Health & Welfare; covers standards for good laboratory practices (GLPs) for non-clinical laboratories and establishes inspection standards

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Canada	HHS	Food & Drug Reg.	84/04	Indef		FDA MOU with National Health & Welfare on sanitary practices prevailing in the shellfish industry of Canada & the U.S.
Canada	HHS	Food & Drug Reg.	74/12	Indef		FDA MOU with Health Protection Branch, National Health & Welfare; radiation transmission & human exposure from electronic products; control of radiation emission and human exposure from electronic products
Canada	HHS	Food & Drug Reg.	73/10	Indef		FDA MOU with Health Protection Branch, National Health and Welfare; drug, GMPs pharmaceuticals inspection; mutual cooperation and exchange of drug plant inspection information
Canada	HHS	Health Statistics	87/01	89/12		Cooperation between the PHS National Center for Health Statistics and Vital Statistics Council for Canada; Statistics Canada Advisory Commission on health statistics

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Canada	NASA	Space & Aeronautics	88/09	Indef	rmk	Entering Phase C/D of Space Station Program; Detailed Design & Development; total funding for international partners in excess of \$7.0 billion, Canadian hardware accounting for over \$1 billion
Canada	NASA	Space & Aeronautics	84/03	Indef	114	Cooperative participation in Upper Atmospheric Research Satellite (UARS), including ozone monitoring
Canada	NIST	Basic Sciences	88/09	93/09	nb	MOU with National Research Council of Canada for collaboration with respect to development and online dissemination of scientific numeric databases
Canada	NOAA	Atmospheric Science	85/06	90/06		MOU to improve the cooperation and coordination of climate related programs and activities jointly undertaken by the U.S. and Canada
Canada	NOAA	Space Technologies	84/07	Indef		MOU for direct reception & distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 & Landsat-5

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Canada	NPS	Natural Resources	Indef	Indef	15	Policy coordination; US-Canada Joint Commission on National Parks; joint World Heritage nomination; Cabin Creek Coal Mine policy coordination; supplemental funding from other sources of \$30,000
Canada	NRC	Nuclear Safety	87/05	90/05	nb	Piping integrity research
Canada	NRC	Nuclear Safety	84/02	87/02	nb	Severe accident research; new agreement signed by NRC; awaiting signature by Canada
Canada	USGS	Earth Sciences	85/01	90/12	30	Atmospheric deposition: standardization of monitoring equipment & procedures; Canada provides estimated \$30,000 in funding
Canada	USGS	Earth Sciences	81/04	91/04	200	Joint marine, geophysical, & water resources research; ore deposit modeling; platinum group element projects; Great Lakes seismic studies; Arctic research; mapping data exchange; international strategic minerals inventory
Chile	NASA	Space & Aeronautics	87/08	87/09	nb	Antarctic expedition to research ozone depletion
Chile	NASA	Space & Aeronautics	85/08	93/08	nb	Use of Easter Island Airport for Shuttle emergency landing

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Chile	USGS	Earth Sciences	87/04	90/04		Seismic zoning & implementation of improved earthquake resistant designs; funded by AID/OFDA at \$70,000
China	Army/COE	Natural Resources	86/05	91/04	225	Protocol between Army and Ministry of Water Resources and Electric Power on water resources & related areas under umbrella agreement; annexes provide for specific research on improved navigation project design; other navigation-related research with the Ministry of Communications
China	BReclam	Natural Resources	84/08	88/12		Multipurpose dam development; advisory assistance in design, construction & related aspects of a high dam on the Yangtze River gorge; advisory assistance on roller-compacted dam design and construction PRC funding of \$300,000
China	Census	Statistics	84/07	89/07		This protocol provides for cooperation and exchange in the field of statistics. Annexes cover exchange of statistical information, exchange of technical-professional delegations, university, statistical training, and applied statistical training

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
China	DOE	Energy	79/01	89/01		Cooperation in high energy physics to include theoretical & experimental research, accelerator design & construction techniques
China	DOE	Energy (Fusion)	83/05	88/05		Cooperation in promoting each other's program in nuclear physics & controlled magnetic fusion
China	DOE	Energy (Fossil)	85/04	90/04		Cooperation in fossil energy R&D with emphasis on atmospheric & pressurized fluid bed combustion; surface coal gasification; coal liquifaction & enhanced oil recovery
China	DOT	Transportation	87/01	Indef	nb	Agreement between DOT/USCG & the Bureau of Harbor Superintendency; covers all areas of search & rescue cooperation
China	DOT	Transportation	87/05	88/05	nb	Annex II to Protocol between DOT & MOC: Cooperation between DOT, DOD Corps of Engineers and PRC Bu of S&T in part engineering & waterborne transport

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
China	DOT	Transportation	86/12	91/12	nb	Protocol between DOT/FRA & Ministry of Railways under the umbrella S&T agreement; covers all areas of rail transportation
China	DOT	Transportation	83/05	88/05	nb	Annex I to Protocol between DOT & MOC; cooperation between DOT/FHWA and Bureau of Highways in all areas of highway transportation
China	DOT	Transportation	83/05	88/05	nb	Protocol with the Ministry of Communications (MOC) under the umbrella S&T agreement; urban systems; transport research planning; highway construction & safety; civil aviation technical assistance
China	EPA	Environment	80/01	Indef	nb	US-PRC Protocol on Environmental Cooperation (5-year renewals) involves five ongoing projects under two annexes on aquatic effects of environmental pollution; health research (lung cancer); modeling of air pollution transport & transformation; water pollution transport; & pollution of soil & groundwater. A 6th project, environmental management, under the newly-signed 4th Annex, is in planning

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
China	FWS	Natural Resources	86/11	Indef	20	Exchange of scientists to work on activities relating to endangered species
China	HHS	Biomedical Sciences	83/05	88/05	2	Agreement between NIH & the Chinese National Academy of Sciences on basic biomedical sciences
China	HHS	Biomedical Sciences	87/08	92/08		Agreement between the National Eye Institute, NIH, and the Zhongshan Ophthalmic Center, Chinese Acad. Med. Sciences
China	HHS	Biomedical Sciences	83/06	89/06	2	Agreement between National Institute of Neurological and Communicative Disorders and Stroke, NIH; and the Shanghai Brain Research Institute, Acad. of Sciences
China	HHS	Biomedical Sciences	79/06	93/06	239	Cooperation under Health Protocol with Chinese Academy of Medical Sciences; cancer; cardiovascular diseases; infectious diseases; environmental health; human genetics; reproductive physiology; immunology; biomedical information science; food & drugs; mental health; public health and health services

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
China	HHS	Food & Drug Reg.	88/02	93/02		Agreement to regulate ceramicware intended for use in the preparation, serving or storage of food or drink and offered for export to the U.S.
China	NIST	Metrology	79/01	89/05	nb	Protocol with the State Bureau of Metrology under the umbrella S&T agreement; joint studies in metrology, standards (including engineering standards), & related applied sciences; temperature, electrical, optical, length, mass, & time measurements & standards; guidelines, protocols, & standards for electronic data processing; building technology; analytical chemistry; metallic & non-metallic materials measurements & standards; applied mathematics
China	NOAA	Atmospheric Science	79/05	89/05	53	Protocol on Cooperation in Atmospheric S&T; joint meteorologic studies; training

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
China	NOAA	Marine Science	79/05	89/05	270	Under the protocol on cooperation in the field of Marine and Fisheries S&T information exchange; cooperative research (such as TOGA); training (such as scientific training and data management); and supply of equipment
China	NOAA	Space Technologies	85/07	Indef		MOU for direct reception & distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 & Landsat-5
China	NPS	Natural Resources	79/01	89/01	41	Training and exchange; US-China Cultural Accord; natural and cultural heritage; other funding of \$49,000
China	NRC	Nuclear Safety	86/10	91/10	nb	Information exchange
China	NSF	Basic Sciences	80/12	91/12	918	Protocol under S&T umbrella agreement; basic, applied, & social sciences
China	NSF	Earth Sciences	80/05	90/05	750	Protocol under S&T umbrella agreement; joint program with USGS

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
China	NTIS	S&T Information	84/04	89/04	25	Reciprocal exchange of S&T report literature & facilities in the use of available information systems & databases
China	US Gov	S&T Umbrella	79/01	89/01		Agreement established U.S.-PRC Joint Commission on S&T Cooperation; 29 protocols in all fields of science, technology & education; individual cooperating agencies negotiate funding with counterpart agencies
China	USDA	Agricultural Science	79/06	91/04	100	Agricultural R&D under umbrella S&T agreement; exchange of soybean germplasm; comparison of import/export. Negotiations for livestock; corn disease research; watershed management
China	USGS	Earth Sciences	85/01	90/12	200	Survey & Mapping Protocol; joint projects in the cartographic applications of remote sensing & in the development of geographic information systems in cooperation with the Defense Mapping Agency & National Geodetic Survey

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
China	USGS	Earth Sciences	84/07	90/01	103	Earthquake Studies Protocol; PRC provides \$264,000 funding; studies on deep crustal structures in fault zones; premonitory phenomena; crustal stress measurements; seismic networks; rock mechanics; intraplate active fault studies
China	USGS	Earth Sciences	80/01	90/01	50	Surface Water Hydrology Protocol; joint research in sediment transport, hydrologic extremes, hydrologic measurement procedures, instruments & equipment; exchange of hydrologic data & analysis techniques; PRC provides funding estimated at \$50,000
China	USGS	Earth Sciences	80/01	90/01	130	Earth Science Protocol; PRC provides \$26,500 funding; joint research on pyrophyllite deposits; geochemical anomalies in Xinjiang and southwestern U.S.; genetic and descriptive model of Bayan Obo iron-niobium-rare earth deposit, Inner Mongolia, China; and southern China and western U.S. granitoid rocks

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
China (PRC)	NOAA	Fisheries	85/11	90/07		Governing International Fishery Agreements established on a bilateral basis, conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. Exclusive Economic Zone
Colombia	HHS	Biomedical Sciences	81/01	Indef		National Library of Medicine MEDLARS Agreement with the Pan American Federation of Associations of Medical Schools; quid pro quo interlibrary exchanges
Denmark	HHS	Biomedical Sciences	84/01	88/12		International Collaborative Effort on behalf of the National Center of Health Statistics on Perinatal & Infant Mortality
Denmark	HHS	Food & Drug Reg.	75/02	Indef		MOU; FDA recognizes certificate of analysis from government authorities on dry milk products
Denmark	NRC	Nuclear Safety	80/09	85/09	nb	Information exchange; renewal being negotiated

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Denmark/Faroe Island	NOAA	Fisheries	80/01	89/07		Governing International Fishery Agreements established on a bilateral basis, conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. Exclusive Economic Zone
Dominican Republic	USGS	Earth Sciences	88/03	88/03	5	Multidisciplinary investigation into the biochemical corrosion of gates of the Sabana Yegua reservoir. USAID funded at \$13,000
EEC	NOAA	Fisheries	77/06	89/07		Governing International Fishery Agreements established on a bilateral basis, conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. Exclusive Economic Zone.
Egypt	BReclam	Energy	82/09	92/05		Hydro-power & electrical systems rehabilitation; advisory assistance on turbine-runner replacement & rehabilitation of electrical generating equipment at the Aswan High Dam; funding by USAID of \$1.35 million.

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Egypt	BReclam	Natural Resources	87/03	91/07		Development of computer models for the Nile River & various canals; funding by USAID OF \$60,000
Egypt	FWS	Natural Resources	77/04	89/12	100 sfc	Training & research; technical assistance in natural areas management
Egypt	HHS	Biomedical Sciences	85/10	89/05	2.1 mil	U.S.-Egypt agreement on Health Cooperation to develop projects on environmental health; epidemiology of respiratory infections, eye diseases, genetic studies of congenital anomalies, lymphoma/leukemia research, biomedical instrumentation, drugs, biologics, health statistics; and emergency medical services. AID-funded
Egypt	HHS	Biomedical Sciences	82/01	91/11	8 mil	AID-funded NIH program under the Congressionally mandated Middle East Regional Cooperative Program established following the Camp David Accord; epidemiologic & immunologic studies on vector-borne diseases
Egypt	NRC	Nuclear Safety	81/06	86/06	nb	Information exchange; renewal under negotiation

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Egypt	NSF	Basic Sciences	75/06	88/03		1983 MOU provides for activities carried out under the expiring umbrella S&T agreement, including information exchange & joint research; FY 1988 activities are minimal
Egypt	US Gov	S&T Umbrella	81/11	91/11		Agreement relating to cooperation in the areas of science & technology
El Salvador	USGS	Earth Sciences	80/04	89/04		Hazard assessment program; evaluation of seismic hazards; development of seismic risk map; funded by USAID at \$80,000
European Space Agenc	NOAA	Space Technologies	84/02	Indef		MOU for direct reception and distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 and Landsat-5
Finland	DOE	Energy	80/11	90/11		General bilateral agreement for the purpose of establishing wider cooperation in the field of energy research & development
Finland	DOT	Transportation	81/07	Indef	nb	Icebreaking technology

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Finland	HHS	Biomedical Sciences	82/10	Indef		Interagency agreement between PHS & the Ministry of Social Affairs & Health of Finland on occupational safety & health, food & drugs, alcohol abuse, & health services, vaccine development
Finland	HHS	Food & Drug Reg	84/01	Indef		MOU; FDA recognizes certificate of analysis from government authorities on food products
Finland	NRC	Nuclear Safety	85/09	90/09	nb	Information exchange
Finland	NRC	Nuclear Safety	84/09	89/09	nb	Information exchange
Finland	NRC	Nuclear Safety	85/02	88/02	nb	Thermal hydraulics & materials research. Extension under review
Finland	NSF	Basic Sciences	86/04	91/04	24	Projects under the umbrella S&T agreement; prior MOU existed from 8/80-8/85; visits; personnel & staff exchanges; fellowships; joint research, seminars, & workshops

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Finland	US Gov	S&T Umbrella	85/09	90/09		Agreement on cooperation in science & technology; agreement contains an Intellectual Property Annex for protection of copyrights, patents, other intellectual property; individual cooperating agencies negotiate funding with counterpart agencies
France	DOC	Technical Commercial	86/02	91/02		Through Office of Productivity, Technology & Innovation, Economic Affairs. Modeled after Israel BIRD and India PACT agreements. Seven joint ventures concluded in 1988
France	DOE	Energy (Fossil)	88/02	91/02		Establish a balanced exchange of R&D information on enhanced oil recovery techniques
France	DOE	Energy (Nuclear)	83/04	93/04		Cooperation on research, development, test & evaluation to improve physical protection of nuclear materials & facilities
France	DOE	Energy (Nuclear)	83/07	93/07		Cooperation in all phases of radioactive waste management
France	DOE	Energy (Nuclear)	85/09	90/09		Cooperation in the field of remote systems technology

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
France	DOE	Energy (Nuclear)	86/06	91/06		Exchange and sharing of nuclear criticality data
France	DOE	Energy (Nuclear)	77/01	87/12		Balanced exchange of technology in liquid metal fast breeder reactors
France	DOE	Energy (Nuclear)	85/05	90/05		Cooperate on R&D to improve national nuclear material accounting and control techniques
France	DOT	Transportation	72/02	Indef	nb	Exchanges on automated guideway transit assessment; project agreements on urban & rail technology and operations
France	EPA	Environment	84/01	Indef	nb	Five-year renewable MOU between EPA & the Ministry of Environment; exchanges on drinking water, wastewater treatment & sludge management are current focal points
France	HHS	Biomedical Sciences	69/01	Indef		National Library of Medicine MEDLARS Agreement with the French Institute of Health & Medical Research; quid pro quo interlibrary exchanges

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
France	HHS	Biomedical Sciences	84/10	89/10	132	Agreement between NIH & the French Institute of Health & Medical Research on cancer, cardiovascular, pulmonary, immunology & infectious diseases, instrumentation, biomedical engineering and neuro-sciences, instrumentation; technology assessment, and AIDS research
France	HHS	Food & Drug Reg.	87/01	Indef		MOU; FDA recognizes certificate of analysis from government authorities on dry milk
France	HHS	Food & Drug Reg.	86/07	Indef		MOU; mutually recognized good laboratory practices (GLP) inspections
France	NASA	Space & Aeronautics	87/03	Indef	19	Cooperative participation in TOPEX/POSEIDON oceanography mission
France	NASA	Space & Aeronautics	84/09	94/09	nb	Use of Hao (French Polynesia) for Shuttle emergency landing

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
France	NIST	Engineering	86/12	91/12	nb	Cooperation in building technology; joint research & exchanges; extensive collaboration with the Centre Scientifique et Technique du Batiment in environmental engineering, materials durability, fire research, accoustics, evaluation of building systems, plumbing, & building economics
France	NIST	Materials Science	84/10	89/09	nb	Agreement with Institut Max von Laue-Paul Langevin; development of the use of cold neutrons in materials research; NBS is installing a cold source, guide system & instrumentation; the Institut has operated a cold source since 1972 & installed a second source in 1986 for use in developing new instruments; studies in nuclear & fundamental physics
France	NOAA	Marine Science	69/11	Indef		U.S.-France cooperation in oceanography; joint multidisciplinary oceanographic research; information & data exchanges

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
France	NOAA	Space Technologies	86/03	96/03		France provides onboard data collection system flown on NOAA polar-orbiting satellite; France also provides the data processing system for ARGOS
France	NRC	Nuclear Safety	86/12	91/12	nb	LWR safety R&D
France	NRC	Nuclear Safety	87/03	90/03	nb	Piping integrity research
France	NRC	Nuclear Safety	83/06	88/06	nb	Fast breeder reactor safety research
France	NRC	Nuclear Safety	84/01	89/01	nb	Safety of radioactive waste management
France	NRC	Nuclear Safety	86/09	91/09	nb	Thermal hydraulic research
France	NRC	Nuclear Safety	84/12	Indef	nb	Pressure tests to failure of a concrete containment model
France	NSF	Basic Sciences	70/01	98/12	535	MOU for joint research & workshops
France	USDA	Agricultural Science	87/03	92/03	50	Agricultural S&T; forestry reproductive biology of the Meishan pig; comparison of remote sensing data for agricultural use

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
France	USGS	Earth Sciences	85/07	91/07	123	Joint studies in water resources research, radioactive waste, oceanographic research, geochemistry research, mineral deposits, geophysics, & sea-ice research & remote sensing in polar regions; \$15,000 Gov't of France & other funding
Gambia	NASA	Space & Aeronautics	88/03	98/03	nb	Use of Banjul International Airport as STS emergency landing site
German Dem Rep	NOAA	Fisheries	77/03	90/08		Governing International Fishery Agreements established on a bilateral basis, conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. Exclusive Economic Zone
Germany, Fed Rep	DOE	Energy (Nuclear)	77/09	99/09		R&D to improve nuclear material safeguards & physical security
Germany, Fed Rep	DOE	Energy (Nuclear)	74/12	89/12		Cooperation in radioactive waste management regarding the disposal of separated waste products & disposal of spent fuel

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Germany, Fed Rep	DOE	Energy (Nuclear)	76/06	87/12		Cooperation in the design, development, construction & operation of liquid metal fast breeder reactors. Being renegotiated to include France, UK, Italy and Belgium)
Germany, Fed Rep	DOE	Energy (Nuclear)	77/02	92/02		Cooperation in the development of high temperature gas cooled reactors
Germany, Fed Rep	DOE	Energy (Nuclear)	84/11	90/11	i	Immobilization processes for high level radioactive waste
Germany, Fed Rep	DOT	Transportation	79/07	Indef	nb	Agreement with Ministry of Transport (3/75) & a related agreement with the Ministry of Research & Technology (7/78); automated guideway transit assessment; freight demand forecasting; travel behavior research; transit bus technology; highway engineering & operation

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Germany, Fed Rep	EPA	Environment	74/01	Indef		Governmental agreement, five-year automatic renewal, with EPA & Ministry of Environment, Nature Protection & Reactor Safety as the lead agencies; broad range of cooperation on auto emissions, acid deposition, economic incentives, improved regulatory approaches, hazardous waste management & enforcement, chemical substances, pesticides, radiation, water pollution control, technologies for control of air pollution from stationary sources, protection of drinking water, soil pollution, etc.
Germany, Fed Rep	HHS	Biomedical Sciences	69/01	Indef		National Library of Medicine MEDLARS Agreement with the FRG Institute of Medical Documentation & Information; quid pro quo interlibrary exchanges

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Germany, Fed Rep	HHS	Biomedical Sciences	76/09	91/09	113	HHS Agreement with the Ministry of Research & Technology in the Field of Biomedical Research & Technology; cardiovascular, pulmonary, & blood diseases; cancer research; arthritis and AIDS research
Germany, Fed Rep	HHS	Biomedical Sciences	84/01	88/12		International Collaborative Effort of the National Center for Health Statistics on Perinatal & Infant Mortality
Germany, Fed Rep	NASA	Space & Aeronautics	Indef	Indef	nb	Reimbursable flight of German D-2 Spacelab mission for microgravity research on Shuttle
Germany, Fed Rep	NASA	Space & Aeronautics	82/08	Indef	2700	Cooperative participation in Rosat x-ray survey satellite
Germany, Fed Rep	NASA	Space & Aeronautics	87/10	Indef	nb	German X-brand Synthetic Aperture Radar (X-SAR) to fly with SIR-C on STS
Germany, Fed Rep	NASA	Space & Aeronautics	77/10	Indef	71	Cooperative participation in Galileo mission to Jupiter
Germany, Fed Rep	~~NASA~~	Space & Aeronautics	81/09	Indef	51	Cooperative participation in Gamma Ray Observatory program

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Germany, Fed Rep	NRC	Nuclear Safety	85/02	87/06	nb	Gundremmingen KRB-A reactor pressure vessel. Extension under negotiation
Germany, Fed Rep	NRC	Nuclear Safety	85/04	88/09	nb	Thermohydraulic behavior of emergency core cooling during the refill & reflood phase of a LOCA in a PWR
Germany, Fed Rep	NRC	Nuclear Safety	86/01	88/09	nb	Joint development of a prototype AFDM
Germany, Fed Rep	NRC	Nuclear Safety	84/04	88/09	nb	SIMMER-II computer code transition phase phenomena
Germany, Fed Rep	NRC	Nuclear Safety	81/04	91/04	nb	Reactor safety research program
Germany, Fed Rep	NRC	Nuclear Safety	87/04	88/07	nb	Modification to the CONTAIN to include an exventing system model steam and/or water release from concrete & improved models for sodium concrete interactions
Germany, Fed Rep	NRC	Nuclear Safety	86/07	91/07	nb	Information exchange
Germany, Fed Rep	NRC	Nuclear Safety	83/04	87/04	nb	Severe accident research; extension under review; new agreement under negotiation
Germany, Fed Rep	NRC	Nuclear Safety	85/02	90/02	nb	Thermal hydraulic research

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Germany, Fed Rep	NRC	Nuclear Safety	84/09	89/09	nb	Nuclear safety research program at a high-temperature demonstration reactor facility
Germany, Fed Rep	USDA	Agracultural Science	81/03	ev.5 yrs	35	Effect of distribution on forest and crops human nitriton and food technology, plant protection
Germany, Fed Rep	USGS	Earth Sciences	75/07	93/07	20	Joint research in marine seismology, radioactive wastes, petroleum resource assessment & Antarctic studies; sea-ice studies, marine minerals; international strategic minerals inventory
Greece	EPA	Environment	Indef	Indef		No formal framework; current project on epidemiological systems & determination of cancer hot spots
Greece	NRC	Nuclear Safety	83/19	88/10	nb	Information exchange
Greece	USDA	Agricultural Science	81/06	Indef	5	Germplasm exchange
Guatemala	HHS	Biomedical Sciences	79/01	Indef	235	Ministry of Health, Universidad del Valle, and the U.S. Centers for Disease Control collaborate in vector-borne parasitic disease research and training

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Hungary	DOT	Transportation	78/10	Indef	nb	Three formal project agreements covering rail track stability, design/construction of steel & concrete bridges, computer techniques in roadway & bridge design; exchanges on road/rail crossings safety; and exchange of research abstracts
Hungary	HHS	Biomedical Sciences	77/04	87/12	43	NIH projects under the U.S.-Hungary Cultural, Education & Science agreement; cardiovascular, pulmonary, & blood diseases; individual health sciences exchanges
Hungary	HHS	Biomedical Sciences	81/02	Indef	17	Agreement between the National Cancer Institute & the Hungarian National Institute of Oncology for cancer research
Hungary	NIST	Metrology	84/11	Indef	nb	Cooperation with the Research Institute for Technical Physics under the umbrella S&T agreement; short-term exchange of scientists; extended visits in cooperating laboratories; joint research; intercomparison of national standards; information exchanges

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Hungary	NIST	Metrology	77/04	Indef	nb	Cooperation with the Hungarian National Office of Measures under the umbrella S&T agreement; annual exchanges of up to 16 person-weeks per side in the areas of measurements & standards
Hungary	NSF	Basic Sciences	72/07	91/07	344	Joint research, seminars, & workshops; covers all aspects of basic & applied natural & engineering sciences, social sciences, & math
Hungary	US Gov	S&T Umbrella	77/07	92/07		S&T is a subset of overall agreement for cooperation in culture, education, science & technology
Hungary	USGS	Earth Sciences	86/01	89/07		Assessment of petroleum resource potential in the Pannonian Basin of Hungary; funded by the World Bank at \$360,000
Hungary	USGS	Earth Sciences	82/03	92/02	10	Cooperative geophysical research projects

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Iceland	HHS	Food & Drug Reg.	78/12	Indef		MOU for establishing procedures for assuring the safety of imported shellfish
Iceland	NOAA	Fisheries	84/11	89/07		Governing International Fishery Agreements established on a bilateral basis, conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. Exclusive Economic Zone
Iceland	USGS	Earth Sciences	82/04	90/04	80	Agreement in cooperation with the National Research Council; information & personnel exchanges; joint research in geophysical, geological, & hydrological phenomena
India	BReclam	Natural Resources	87/06	90/06		Training in dam safety and instrumentation of dams; UNDP funding of \$100,000
India	DOC	Technology Commer.	85/08	90/08	AID	Through Office of Productivity, Technology and Innovation, Economic Affairs. Modeled on the Israel BIRD Foundation. 12 joint ventures concluded in 1988

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
India	DOE	India	87/08	92/08		Cooperation on R&D activities pertaining to enhanced oil recovery, underground coal gasification and related technologies
India	EPA	Environment	86/01	Indef	nb	EPA works with GOI environmental authorities under the US-India Fund; principal project is the Ganges River cleanup; two joint toxicology research projects are being formulated with initiation expected in FY 89. EPA is reviewing two project proposals by NEERI.
India	FWS	Natural Resources	78/01	Indef	500 sfc	Research projects in endangered species & training in wildlife management; public education efforts
India	HHS	Biomedical Sciences	83/11	89/11	300	MOU for cooperation between ADAMHA & the Indian National Institute of Mental Health & Neuro Sciences; projects in alcoholism, drug abuse, & mental health

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
India	HHS	Biomedical Sciences	84/07	89/07		MOU formalized long-standing relationship between NIH laboratories & selected Indian Council for Scientific & Industrial Research laboratories, basic research in cellular molecular biology and biophysics
India	HHS	Biomedical Sciences	62/01	Indef	334	Indo-U.S. Subcommittee on S&T; areas include infectious diseases, blindness prevention, reproductive physiology, molecular biology, pharmacology, child health & development, mental health, substance abuse, longitudinal, demographic and health trends, iron deficiency anemia, health services research, occupational health, cancer, neurology, & information exchanges
India	HHS	Biomedical Sciences	82/01	88/12	68	Projects under the Reagan-Gandhi S&T initiative; NIH conducts projects in immunology & reproduction, blindness prevention, leprosy, filariasis, tuberculosis, malaria)

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
India	HHS	Biomedical Sciences	87/06	92/06	6000	Vaccine & immunodiagnostics development; vaccine quality control; immunization programs development; the Vaccine Action Program is a joint effort by PHS & USAID; nodal Indian agency is the Department of Biotechnology with MOHFW & Council of Medical Research involvement
India	NIST	Basic Sciences	74/10	Indef	sfc	Projects conducted under the US-Indo Joint Commission; includes 11 projects in materials and physical sciences in cooperation with 20 Indian institutions; expansion of the program was proposed in FY 1987 through 8 additional projects in materials science and 10 more in physical sciences; in FY 1988, 5 additional projects were proposed
India	NOAA	Earth Sciences	74/10	Indef		Two joint research projects in solar-terrestrial physics under the Indo-U.S. Subcommission on S&T
India	NOAA	Space Technologies	84/10	Indef		MOU for direct reception and distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 and Landsat-5

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
India	NPS	Heritage Site Plan'g	88/01	Indef	3500 sfc	Joint planning and specialized resource assessments for Taj Mahal National Historical Park and Buddhist sites
India	NPS	Natural Resources	79/10	Indef	298 sfc	Technical assistance; park & conservation planning & management, technical assistance & training; funding from other sources \$2,302,000
India	NSF	Basic Sciences	75/01	Indef	495	Cooperative Science Program under the Indo-U.S. Subcommission on S&T; joint workshops; visits; supports attendance at international meetings; information & data exchanges; translation services
India	NSF	Basic Sciences	83/10	91/10		S&T initiative signed by President Reagan & Prime Minister Gandhi; NSF serves as Executive Agent; FY 1988 extension will continue studies in agriculture, biomass, engineering and solid state sciences, and monsoon research, also explore new areas

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
India	US Gov	S&T Umbrella	83/10	91/10		Agreement by President Reagan & Prime Minister Gandhi to launch the Science & Technology initiative (STI) on 7/28/82; initiative implemented Oct. 83; renewed for 3 years Oct 85 and Oct 88; covers the fields of health, agriculture,
India	USGS	Earth Sciences	75/01	Indef.	10	U.S.-India fund provides about \$30,000; multidisciplinary workshops & identification of other mutually beneficial joint research projects
Indonesia	BRclam	Natural Resources	87/06	89/06		Dam safety evaluation of existing structures; training in dam safety inspection; funding by Indonesia of \$250,000
Indonesia	DOT	Transportation	88/07	Indef	nb	USCG-GOI Agreement on Maritime Search & Rescue
Indonesia	HHS	Biomedical Sciences	79/10	90/09	144	Centers for Disease Control/AID technical assistance program with MOH aimed at reducing morbidity and mortality due to vaccine-preventable and diarrheal diseases

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Indonesia	US Gov	S&T Umbrella	79/10	89/10		Agreement on cooperation in scientific research & technological development; individual cooperating agencies negotiate funding with counterpart agencies
Indonesia	USGS	Earth Sciences	84/04	88/08		Volcano Monitoring & Research Program; funded by AID/OFDA at 165,000; residential team leader and 6 TDYs
Indonesia	USGS	Earth Sciences	87/01	Indef	62	Peat studies as modern analogs to U.S. coal fields; field visit to Kalimantan
Indonesia	USGS	Earth Sciences	86/02	90/06		Five year marine geology program funded by the Asian Development Bank at \$1 million; project provides for a resident team leader & 10 TDYs for 2.5 man-months each. In FY 88 funded at \$529,000
Ireland	HHS	Food & Drug Reg	88/01	93/01		FDA agreement covering caseins, caseinates and mixtures thereof exported to the U.S.
Ireland	USDA	Agricultural Science Pending			40	A forage/livestock management, extension food technology

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Israel	BReclam	Natural Resources	84/05	89/05		S&T exchange program in water resources; joint funding
Israel	BReclam	Natural Resources	84/05	89/05		Technical assistance in water resources development
Israel	DOE	Energy	84/06	89/06		General bilateral agreement for the purpose of establishing wider cooperation in the field of energy research & development
Israel	DOE	Energy (Physics)	87/05	92/05		Cooperation in high energy physics, applied mathematical sciences, and other basic energy sciences
Israel	DOE	Energy (Renewable)	87/11	89/11		Cooperation in use of ceramic receivers and thermochemical conversion of hydrocarbons for distributed and central receivers
Israel	DOE	Energy (Renewable)	85/06	90/06		Cooperative work in low cost solar cells, absorption heat pump studies & research in amorphous silicon films
Israel	DOE	Energy (Renewable)	87/11	89/11		Cooperation in the use of metal hydride slurries in heat pumps
Israel	DOE	Energy (Renewable)	85/06	90/06		Cooperative studies and research in biomass systems

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERMI- NATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Israel	DOE	Energy (Renewable)	85/06	90/06		Cooperation to advance understanding of absorption cycles & working fluids for solar cooling
Israel	HHS	Biomedical Sciences	80/01	90/12		Agreement with the Israeli Ministry of Health; covers areas of biomedical sciences of mutual interest & health statistics
Israel	HHS	Biomedical Sciences	83/03	88/03		Activities are under a Plan for Mutual Cooperation with the Ministry of Labor & Social Affairs in the areas of alcohol abuse & alcoholism; covers mutually beneficial exchanges, work-study programs, and joint studies
Israel	NRC	Nuclear Safety	83/04	93/06	nb	Information exchange
Israel	NSF	Basic Sciences	72/09	90/05	24	Most activities under BSF program; MOU signed by NCRD/NSF 5/85 for personnel & information exchanges in basic & applied sciences; program presently is supporting annual workshops on subjects of mutual interest to the science communities

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Israel	US Gov	S&T Umbrella	77/10	Indef		Agreement to establish the Binational Industrial Research & Development Foundation (BIRDF); US & Israel contributed equally to a \$110 million endowment; interest earnings are used to fund joint venture projects between US and Israeli companies. Agreement also establishes the Binational Agricultural Research and Development Fund (BARD). US and Israel contributed equally to a \$110 million endowment. Interest earnings are used to fund joint agricultural research projects
Italy	BRclam	Natural Resolurces	86/10	91/10	98	Technical cooperation in dam safety engineering; joint funding
Italy	DOE	Energy	85/12	90/12		General bilateral agreement for the purpose of establishing wider cooperation in the field of energy research & development
Italy	DOE	Energy (Renewable)	75/06	90/06		Collaboration in geothermal R&D to include hot dry rock, brine utilization & deep drilling methods
Italy	DOT	Transportation	72/02 II-50	Indef	nb	Transport system safety ,

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Italy	EPA	Environment	87/03	Indef		At Italian request, EPA concluded a formal MOU with the newly-established Ministry of Environment; subsequent governmental reorganization has precluded implementation; ongoing contacts exist in the fields of dioxin control, wastewater management & solid waste management & recycling
Italy	HHS	Biomedical Sciences	77/11	Indefin.	190	Agreement under the umbrella S&T agreement with the Italian Ministry of Health in health & biomedicine; renewable every 3 years; covers environmental health, cardiovascular & pulmonary diseases, cancer, biomedical communication, infectious diseases & immunology, human reproduction, metabolic diseases, vision research, laboratory animals, dental research, aging, & perinatal medicine, and neurosciences
Italy	HHS	Biomedical Sciences	81/07	87/12		Projects under the umbrella S&T agreement; psychopharmacology research between the National Institute of Mental Health & the University of Pisa

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Italy	NASA	Space & Aeronautics	84/03	Indef	11	Cooperative development of the Tethered Satellite System
Italy	NASA	Space & Aeronautics	84/03	Indef	9	Cooperative participation in Lageos geodynamics satellite
Italy	NRC	Nuclear Safety	87/06	91/06	nb	Severe accident research
Italy	NRC	Nuclear Safety	81/04	86/04	nb	Information exchange; renewal text is awaiting signature
Italy	NRC	Nuclear Safety	86/01	91/01	nb	Thermal hydraulic research
Italy	NSF	Basic Sciences	87/06	91/06	213	Projects under S&T umbrella agreement (NSF was Executive Agency thru 6/86); MOU provides for joint research, seminars & workshops; information & personnel exchanges; installation utilization; training; intellectual property rights
Italy	US Gov	S&T Umbrella	88/04	93/04		Agreement for scientific & technological cooperation; agreement contains intellectual property provisions; individual cooperating agencies negotiate funding with counterpart agencies

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Italy	USGS	Earth Sciences	81/07	87/12	24	Program under the S&T umbrella agreement; development & installation of digital real-time seismographs; hydrological hazards workshop; development of new technology. \$74,000 GOI & other funding
Italy	USGS	Earth Sciences	85/04	88/01		Southern Italy Earthquake Reconstruction Program; upgrade of seismic/volcanic program to improve early warning capability for volcanic eruption in the Campi Flegrei region; funded by USAID at \$75,000
Ivory Coast	HHS	Disease Control	87/05	Indef		Centers for Disease Control & Ministry of Health collaboration in HIV-1 and HIV-2 epidemiology, laboratory surveillance and research
Japan	DOE	Energy	79/05	89/05		General bilateral agreement for the purpose of establishing wider cooperation in the field of energy research & development
Japan	DOE	Energy	84/04	89/04		Research on the effects of electrical fields associated with high voltage transmission lines on primates

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Japan	DOE	Energy	79/11	89/05		Cooperation in high energy physics including research, accelerator & detector instrumentation R&D & the fabrication & subsequent use of new experimental devices & facilities
Japan	DOE	Energy (Fossil)	87/05	89/05		Comprehensive cooperation in various phases of coal technology development
Japan	DOE	Energy (Fusion)	83/01	89/05		Cooperative exchange of information, personnel & equipment, & special activities as may be agreed with various ministries, as established by exchange of diplomatic notes & separate agreements with each ministry
Japan	DOE	Energy (Fusion)	79/08	88/08		Undertake experimental research on tokamak plasmas in the Doublet III, a tokamak facility
Japan	DOE	Energy (Fusion)	79/08	92/08		Establish a coordinating committee to facilitate the implementation of cooperative activities in fusion research
Japan	DOE	Energy (Nuclear)	79/01	89/01		Cooperation in the design, development, construction & operation of liquid metal fast breeder reactors

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Japan	DOE	Energy (Nuclear)	88/03	92/03		Cooperate in improving effectiveness of techniques to implement nuclear safeguards
Japan	DOE	Energy (Nuclear)	86/12	96/12		Cooperatively develop technology for safe management of radioactive waste
Japan	DOE	Energy (Nuclear)	85/09	90/09		Cooperation in the development of high temperature gas cooled reactor technology
Japan	DOE	Energy (Nuclear)	84/04	85/05		Evaluate the impact of the TMI accident, emergency countermeasures & reactor behavior; develop industrial technologies with respect to decontamination & waste treatment
Japan	DOE	Energy (Renewable)	81/09	89/05		Cooperation in research in solar energy conversion by means of photosynthesis
Japan	DOE	Energy (Renewable)	78/06	88/06		Establish a balanced exchange of geothermal energy application technology
Japan	DOE	Energy (Renewable)	82/05	89/05		Establish a balanced exchange of solar technology in solar thermal power systems, photovoltaic power systems & solar heating & cooling

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Japan	DOT	Transportation	69/07	Indef	nb	US-Japan Transportation Research Panel established through the Joint Economic & Trade Committee; urban systems; traffic management; high speed rail, including magnetic levitation; aviation R&D; environment control strategies
Japan	EPA	Environment	75/01	Indef	nb	Self-renewing governmental agreement on environmental protection; 15 projects cover a wide range of issues including mobile & stationary source control, hazardous waste management, wastewater treatment, drinking water protection, management of contaminated bottom sediments, etc.
Japan	HHS	Biomedical Sciences	76/01	91/01		Vision research; agreement between the National Eye Institute & the Japan Society for the Promotion of Science
Japan	HHS	Biomedical Sciences	84/09	88/09	14	Gerontology research; agreement between the National Institute on Aging & Tokyo Metropolitan Institute of Gerontology

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Japan	HHS	Biomedical Sciences	74/01	Indef		National Library of Medicine MEDLARS Agreement; quid pro quo interlibrary exchanges
Japan	HHS	Biomedical Sciences	74/05	89/05	95	Agreement between the National Cancer Institute & the Japan Society for the Promotion of Science in the area of cancer research
Japan	HHS	Biomedical Sciences	80/01	88/06	23	Projects under the non-energy umbrella S&T agreement; exchanges, work-study programs, & joint research; covers cardiovascular diseases, laboratory animals, toxicology, recombinant DNA, vaccine development, antiviral agents, & alcohol-related problems
Japan	HHS	Biomedical Sciences	65/04	Indef	185	U.S.-Japan Cooperative Medical Sciences Program; projects in infectious & viral diseases, malnutrition, environmental mutagenesis & carcinogenesis, & AIDS
Japan	HHS	Food & Drug Reg.	62/10	Indef		MOU with FDA on sanitation of shellfish for export; inactive since 1984 since there have been no shellfish exports

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Japan	HHS	Food & Drug Reg.	83/04	Indef		Mutual acceptance of inspectional data concerning good laboratory practice (GLP) with Pharmaceutical Affairs Bureau, MOH
Japan	NASA	Space & Aeronautics	88/09	Indef	rmk	Entering Phase C/D of Space Station Program; Detailed Design and Development; total funding with international partners in excess of \$7.0 billion; Japanese hardware accounting for \$2 billion
Japan	NASA	Space & Aeronautics	88/01	Indef	nb	Direct reception of data from Japan's JERS-1 spacecraft at a NASA receiving station
Japan	NASA	Space & Aeronautics	Indef	Indef	nb	Reimbursable flight of Japanese spacelab mission on shuttle
Japan	NASA	Space & Aeronautics	85/01	90/01	nb	Use of Japanese airport for Shuttle emergency landing
Japan	NIST	Telecommunications	84/10	89/10	nb	Agreement with the Nippon Telegraph & Telephone Public Corporation; joint research on semiconductors, telecommunications, computers & computer networking, time & frequency measurements, & related fields

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Japan	NOAA	Fisheries	77/11	89/12		Governing International Fishery Agreements established on a bilateral basis, conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. Exclusive Economic Zone
Japan	NOAA	Marine Science	64/01	Indef		US-Japan Cooperative Program in Natural Resources; joint multidisciplinary research projects; information & data exchange
Japan	NOAA	Space Technologies	83/08	Indef		MOU for direct reception & distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 & Landsat-5
Japan	NPS	Natural Resources	86/11	91/11	10	Exchange; US-Japan agreement on development & utilization of natural resources; US-Japan Panels: national parks & other natural areas, conservation, recreation & parks, & city parks & urban affairs
Japan	NRC	Nuclear Safety	84/11	89/11	nb	Radioactive waste management
Japan	NRC	Nuclear Safety	85/12	90/12	nb	Information exchange
Japan	NRC	Nuclear Safety	87/05	91/05	nb	Severe fuel damage & fission product source term research

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Japan	NRC	Nuclear Safety	86/10	87/10	nb	AFDM prototype & CONTAIN computer code; one year extension under negotiation
Japan	NRC	Nuclear Safety	84/02	92/12	nb	ROSA IV safety research of LWR on small break LOCAs & transients
Japan	NRC	Nuclear Safety	84/12	88/09	nb	Contain 1.0 computer code for LMFBR containment analysis
Japan	NRC	Nuclear Safety	86/09	89/09	nb	High-level vibration test of nuclear power plant piping
Japan	NSF	Basic Sciences	61/06	Indef	661	Projects under Joint Communique issued by President Kennedy & Prime Minister Hayato Ikeda; joint research & seminars; collaborative research visits
Japan	NSF	Energy	81/09	89/09	75	Protocol on photosynthesis & photoconversion under umbrella energy agreement with NSF & DOE as co-implementing agencies

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Japan	US Gov	S&T Umbrella	88/06	93/06		Agreement on cooperation & development in science & technology; negotiations currently underway on renewal of the agreement; joint R&D in all areas of S&T, except energy, and cooperation in developing S&T policies of the two countries; individual cooperating agencies negotiate funding with counterpart agencies
Japan	US Gov	S&T Umbrella	79/05	89/05		Agreement on cooperation in research & development in energy & related fields
Japan	USDA	Agricultural Science	80/05	87/10	12	Agricultural S&T under the non-energy umbrella S&T agreement; greenhouse technology; forestry; final agreement on continuing & new projects is awaiting agreement on intellectual property protection in the umbrella agreement

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Japan	USGS	Earth Sciences	85/02	93/02	17	Joint research on deeply buried mineral deposits and gold deposits; Geological Survey of Japan provides funding of \$6,000
Japan	USGS	Earth Sciences	88/08	88/09	19	Debris flow research; experimental studies of bedform alignment related to sediment transport studies on continental shelves and in estuaries. Japan provides approximately \$6,300
Jordan	USGS	Earth Sciences	82/09	89/12		Seismic network program, remote sensing; funded by USAID AT \$179,000
Kenya	HHS	Biomedical Sciences	79/01	Indef	200	Malaria research by the Centers for Disease Control & collaborating Kenyan agencies
Korea	DOE	Energy (Fossil)	81/11	91/10		Exchange of coal related information; personnel exchange & consultation in coal technology
Korea	DOE	Energy (Renewable)	81/11	91/11		Cooperation in the broad area of energy conservation
Korea	DOE	Energy (Renewable)	81/11	91/11		Cooperation in all phases of solar energy research

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Korea	EPA	Environment			nb	A MOU between EPA and Korea Environment Agency was signed Nov. 2, 1987, but does not enter into force until the umbrella US-ROK S&T agreement is signed. Seven subjects for exchange were discussed at the 1987 meeting but none are under way
Korea	HHS	Biomedical Sciences	76/05	88/10		Genetic engineering under U.S.-Korea S&T agreement
Korea	HHS	Biomedical Sciences	86/04	91/04		Toxicological data information exchange & training, Korean Research Institute of Chemical Technology
Korea	NIST	Materials Science	86/09	89/09	nb	Agreement with Korea Advanced Institute of Science & Technology; studies on alloy formation by chemically induced interface migration

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Korea	NIST	Metrology	86/06	89/06	nb	Agreement with the Korea Standards Research Institute to improve knowledge & engineering practices in measuring mechanical properties of materials at low temperatures; low pressure measurement techniques; methodology development for secondary ion mass spectrometric analysis
Korea	NIST	Metrology	86/10	89/10	nb	Agreement with the Korea Institute of Machinery & Metals; investigation of electrodeposited amorphous alloys for application in small scale industrial processes with emphasis on wear, corrosion, & magnetic performance
Korea	NRC	Nuclear Safety	86/05	91/04	nb	Thermal hydraulic research
Korea	NRC	Nuclear Safety	81/11	86/11		Information exchange; renewal under negotiation
Korea	NRC	Nuclear Safety	84/08	90/08	nb	Severe accident research

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Korea	NSF	Basic Sciences	77/05	92/05	267	NSF-KOSEF MOU under S&T umbrella agreement; joint research, seminars, & workshops; long-term joint research visits; short-term project development visits; annual seminar identifies joint priorities
Korea	US Gov	S&T Umbrella	76/05	88/10		Agreement relating to scientific & technical cooperation; negotiations currently underway on renewal of the agreement; individual cooperating agencies negotiate funding with counterpart agencies
Korea	USGS	Earth Sciences	87/01	89/12		Sedimentary basin analysis program; Korea Institute for Energy & Resources provides funding for USGS travel
Korea (ROK)	NOAA	Fisheries	77/03	89/07		Governing International Fishery Agreements established on a bilateral basis, conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. Exclusive Economic Zone

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Malaysia	BReclam	Natural Resources	88/01	Indef		Technical assistance during initial filling of Batu Dam for water conservation & flood control; funding by Malaysia of \$137,000
Mexico	Census	Statistics	86/03	91/03		This cooperation agreement provides for the exchange of methodologies, documents, information, and training and the development and execution of joint statistical projects
Mexico	DOE	Energy (Fossil)	83/06	89/06		Exchange information & develop basic & applied research programs in petroleum technology
Mexico	DOE	Energy (Renewable)	86/04	89/04		Develop an understanding of geothermal reservoirs in sedimentary & fractured igneous rocks
Mexico	DOT	Transportation	72/11	Indef	nb	Highway; rail; maritime search & rescue; oil pollution control; joint border transport planning

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Mexico	EPA	Environment	83/08	Indef	nb	US-Mexican governmental agreement for cooperation in the protection, improvement & conservation of the border environment; specific programs are outlined in annexes to the agreement: 1. solution of the border sanitation problem at San Diego & Tijuana; 2. cooperation on discharges of hazardous wastes along the border; 3. cooperation on transboundary shipment of hazardous substances; 4. cooperation on transboundary air pollution from copper smelters
Mexico	HHS	88/02	93/02			General umbrella agreement between the FDA Mexican SSA to cooperate in the scientific and regulatory fields of health
Mexico	HHS	Biomedical Sciences	84/01	90/12	100	Field epidemiology training by the Centers for Disease Control with the Secretaria de Salud

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Mexico	HHS	Biomedical Sciences	83/12	88/12	24	Joint Working Group on Health, U.S.-Mexico Mixed Commission on Science & Technology; covers diarrheal diseases, maternal & child health (nutrition & breast feeding), diabetes and pregnancy biomedical instrumentation & repair
Mexico	HHS	Biomedical Sciences	76/01	Indef		National Library of Medicine MEDLARS Agreement with Centro Nacional de Informacion y Documentacion en Salud (CENIDS); quid pro quo interlibrary exchange
Mexico	HHS	Biomedical Sciences	84/01	88/11	5	Plan for Scientific Cooperation between NIH & the Center for Research & Advanced Studies, National Polytechnic Institute, Mexico (CINVESTAV IPN); covers neurosciences & endocrinology, neurobiology & anaesthesiology, molecular aging, liver metabolism & drug mechanisms in liver disease treatment, pathobiology & hormonal regulation of membrane transport systems

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Mexico	HHS	Biomedical Sciences	82/03	88/12		National Institute of Alcohol Abuse & Alcoholism Agreement for Scientific Cooperation with the Mexican Institute of Psychiatry includes exchanges, work-study programs & the conduct of joint collaborative alcohol research studies
Mexico	HHS	Food & Drug Reg.	81/10	Indef		FDA MOU with Secretaria de Salud on sanitary practices prevailing in the shellfish industries of Mexico & U.S.
Mexico	NOAA	Earth Sciences	72/06	Indef	100	Assistance in marine data collection & air pollution studies; Gulf of Mexico acid rain & Mexico City air pollution
Mexico	NOAA	Fisheries	86/11	88/11		Joint fisheries research projects in the Gulf of Mexico & Pacific Ocean
Mexico	NOAA	Marine Sc. (Pacific)	86/11	88/11		A MOU for cooperative research on shared resources in the Pacific and for the exchange of scientific information and cooperative research on the fisheries sector

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Mexico	NOAA	Marine Science(Gulf)	86/11	88/11		A MOU for cooperative research on shared resources in the Gulf of Mexico for the exchange of scientific information and cooperative research on the fisheries sector
Mexico	NOAA	Stats/Data Exchange'	88/06	88/11		A MOU for the exchange of scientific and economic data and information on the fisheries sector
Mexico	NRC	Nuclear Safety	87/06	92/06	nb	Nuclear safety research
Mexico	NRC	Nuclear Safety	81/04	86/04	nb	Information exchange; extension under review
Mexico	NSF	Basic Sciences	72/06	Indef	139	Projects under S&T umbrella agreement; information & personnel exchanges; joint research; seminars, workshops, & meetings

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Mexico	US Gov	S&T Umbrella	72/06	Indef		Agreement for scientific & technical cooperation; individual cooperating agencies negotiate funding with counterpart agencies; restructuring of bilateral mixed commission in 1988 to deal with policy and coordination issues only
Mexico	USDA	Agricultural Science	83/12	87/10	16	Agricultural R&D; plant genetic research; screwworm research; pine beetles seminar; nutrition seminar; distributed watershed modeling
Mexico	USGS	Earth Sciences	79/01	88/12		Cooperative Border Mapping Agreement funded by the International Boundary and Water Commission, USGS & the US Customs Service at \$390,000; production & distribution of color image maps by the U.S.; border photography by Direction General de Geografia de Mexico, plus review editing by the International Boundary and Water Commission & the Customs Service
Micronesia	DOT	Transportation	88/06	Indef	nb	USCG-Micronesia Foreign Affairs Ministry Agreement on Maritime Search and Rescue

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Morocco	BReclam	Natural Resources	84/05	89/12		Development assistance in weather modification programs to increase natural water supplies; funding by USAID of \$1.0 million
Morocco	NASA	Space & Aeronautics	87/01	97/01	nb	Use of Ben Guerir airport for Shuttle emergency landing
Multilateral	DOT	Transportation	Ongoing	Ongoing	nb	International Road Federation: highway projects and technical data base coordination
Multilateral	DOT	Transportation	Ongoing	Ongoing	nb	Organization of American States (OAS): Inter-American Port & Harbor Conferences
Multilateral	DOT	Transportation	Ongoing	Ongoing	nb	Permanent International Association of Road Congresses (PIARC)
Multilateral	DOT	Transportation	Ongoing	Ongoing	nb	European Conference of Ministers of Transport (ECMT); various technical subjects; high-level policy discussions in Council Sessions
Multilateral	DOT	Transportation	Ongoing	Ongoing	nb	United Nations Economic & Social Council: Committee of Experts on Transport of Dangerous Goods

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Multilateral	DOT	Transportation	Ongoing	Ongoing	nb	International Union of Railways (UIC); information exchanges; committee projects on rail research; annual membership dues of \$40,000
Multilateral	DOT	Transportation	70/01	Indef	nb	EUROCONTROL Group: Civil Aviation; management information exchanges on air navigation
Multilateral	DOT	Transportation	Ongoing	Ongoing	nb	Pan American Highway Congress: various technical and policy programs for coordination in the Americas
Multilateral	DOT	Transportation	Ongoing	Ongoing	nb	Experimental Safety Vehicle Program: Separate agreements for cooperation with the FRG, France, Italy, Japan, Sweden and the UK, established under auspices of NATO Committee on the Challenges of Modern Society

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Multilateral	DOT	Transportation	Ongoing	Ongoing	nb	Maritime - special groups: Int Assoc of Lighthouse Authorities; Int Working Group on LORAN C; Int Ship Structures Cong; Int Radio Consultative Comm; Panama Canal Seminar on Tonnage System Changes; Seminars on Marine Pollution & Chemical Tankers & Gas; Int Symp on Remote Sensing of the Environment; Venezuela Air Safety Cong; Search & Rescue Satellite-Aided Tracking Demonstration Proj; UNEP Monitoring Comm on the Action Plan for the Caribbean Environment Program
Multilateral	DOT	Transportation	Ongoing	Ongoing	nb	Pan American Railway Congress Association (PARCA)
Multilateral	DOT	Transportation	Ongoing	Ongoing	nb	Permanent International Association of Navigational Congresses (PIANC)
Multilateral	DOT	Transportation	Ongoing	Ongoing	nb	United Nations Economic & Social Commission for Asia & the Pacific (ESCAP)

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Multilateral	DOT	Transportation	Ongoing	Ongoing	nb	United Nations International Telecommunications Union (ITU): World Administrative Radio Conference for Mobile Services
Multilateral	DOT	Transportation	Ongoing	Ongoing	nb	United Nations International Maritime Organization (IMO); annual Assembly; Council; Committees on Maritime Safety, Marine Environment Protection Legal, Facilitation, & Technical Cooperation
Multilateral	DOT	Transportation	Ongoing	Ongoing	nb	United Nations International Civil Aviation Organization (ICAO); annual Assembly Meetings; 9 Regional Groups; 3 special committees; 13 Panels which have established various ad hoc study groups
Multilateral	DOT	Transportation	Ongoing	Ongoing	nb	Organization for Economic Cooperation & Development (OECD); DOT represented on Road Transport Research Program Steering Committee and active in selected research studies

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Multilateral	DOT	Transportation	Ongoing	Ongoing	nb	United Nations International Atomic Energy Agency (IAEA): Standing Advisory Group on Safe Transport of Radioactive Material
Multilateral	DOT	Transportation	Ongoing	Ongoing	nb	United Nations Economic Commission for Europe (ECE): Inland Transport Committee Groups of Experts on Construction of Vehicles (WP 29) & Road Safety (GE 20); Combined Transport (GE 24); Transport of Dangerous Goods (GE 15); Committee on Development of Trade: Facilitation (WP 4)
Multilateral	DOT	Transportation	Ongoing	Ongoing	nb	International Organization for Standardization (ISO); transport vehicle hardware standardization
Multilateral	FWS	Natural Resources	87/01	Indef	499	Institution building & training in western hemisphere countries; grants & projects in support of regional capabilities for managing wildlife

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Multilateral	FWS	Natural Resources	87/01	Indef	10	Training & research in 13 Near East countries; 12 grants in support of biological diversity; USAID funding at \$186,000
Multilateral	FWS	Natural Resources	87/01	Indef	20	Training & research in 8 Asian countries; 8 grants in support of biological diversity; USAID funding at \$260,000
Multilateral	HHS	Biomedical Sciences	79/03	91/09	5610	Child survival & combatting childhood communicable diseases; Centers for Disease Control program of training & logistics planning for advancement of childhood immunization programs, malaria prophylaxis & diarrheal disease control; covers 12 African countries: Burundi, Central African Republic, Guinea, Ivory Coast, Lesotho, Liberia, Malawi, Nigeria, Rwanda, Swaziland, Togo, & Zaire (USAID funded)
Multilateral	HHS	Biomedical Sciences	84/01	89/12	31	International Collaborative effort on Perinatal and Infant Mortality with Denmark, FRG, Israel, Japan, Norway, Sweden and the U.K. by the National Center for Health Statistics

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Multilateral	NIST	Materials Science	87/05	Indef	nb	International accord with France, UK, Italy, Canada, Japan, FRG, & Commission of European Communities; participation in the Versailles Project on Advanced Materials (VAMAS), which now operates independent of the economic heads; VAMAS aims to introduce advanced materials into high-tech products & engineering structures, & encourage trade through agreement on codes of performance; NBS represents the US & chairs the steering committee
Multilateral	NOAA	Marine Science	var.	var.		Governing International Fishery Agreements (GIFAS) with the European Community, Japan, Korea (ROK), China (PRC), Taiwan, Poland, Denmark, German Democratic Republic, Iceland, and USSR
Multilateral	NOAA	Marine Science	var.	var.		Governing International Fishery Agreements (GIFAs) with the European Community, Japan, Korea (ROK), China (PRC), Taiwan, Poland, Denmark, German Democratic Republic, Iceland, and USSR

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Multilateral	NPS	Natural Resources	Ongoing	Ongoing	17	Training & information exchange; training for foreign park professionals in US National Parks, provision of technical information on parks & protected areas to USAID missions and foreign governments
Multilateral	NPS	Natural Resources	Ongoing	Ongoing	13	Technical assistance & information exchange; Man & the Biosphere (MAB) Program; biological surveys & monitoring; reference text development; biosphere reserves; participants include Canada, Mexico, Rwanda, FRG & all MAB countries; other US government funding of \$30,500
Multilateral	NPS	Natural Resources	Ongoing	Ongoing	10	Technical assistance; national park development; participants include African countries, Greece, Malaysia, Nepal, Saudi Arabia, Palau & Portugal; other US government funding of \$90,000; other funding of \$66,900

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Multilateral	NPS	Natural Resources	Ongoing	Ongoing	257	Training; Western Hemisphere Convention & Caribbean Basin Initiative park & protected area development; participants include Argentina, Brazil, Chile, Colombia, Costa Rica, Mexico, Panama, Peru, Venezuela, Barbados, Bermuda, Caribbean Basin & Latin America; other US government funding of \$47,300; other funding of \$269,100
Multilateral	NPS	Natural Resources	Ongoing	Ongoing	45	Information exchange; Western Hemisphere Convention & Caribbean Basin Initiative park & protected area development; participants include Brazil, British Virgin Islands, Caribbean Basin & Latin America; other US government funding of \$150,000; other funding of \$7,200

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Multilateral	NPS	Natural Resources	Ongoing	Ongoing	30	Technical assistance; Western Hemisphere Convention & Caribbean Basin Initiative park development; participants include Argentina, Brazil, Mexico, Grenada, Jamaica, St. Vincent & the Grenadines, Caribbean Basin & Latin America; other US government funding of \$10,813; other funding of \$201,067
Multilateral	NPS	Natural Resources	Ongoing	Ongoing		Training; Peace Corps Volunteer training in national parks & conservation; participants include Malawi, Morocco & Sierra Leone; other US government funding of \$18,000
Multilateral	NPS	Natural Resources	Ongoing	Ongoing	53	Policy coordination; World Heritage Site nomination; cultural resource cooperation with ICOMOS; participants includes World Heritage Convention countries
Multilateral	NRC	Nuclear Safety	87/03	88/09	nb	EURATOM; joint development of a prototype advanced fluid dynamics model (AFDM); extension under consideration
Multilateral	NRC	Nuclear Safety	84/09	89/09	nb	EURATOM; nuclear safety research

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Multilateral	NRC	Nuclear Safety	85/01	90/12	nb	OECD Halden Reactor project
Multilateral	NRC	Nuclear Safety	86/09	89/09	nb	OECD project on LOFT experimental program
Multilateral	USGS	Earch Sciences	88/09	88/09	14	Mineral Deposit Modeling Workshop on Epithermal Gold-Silver Deposits Bolivia
Multilateral	USGS	Earch Sciences	88/03	88/03		Workshop on potential economic impact of earthquake hazards throughout the world sponsored by AID/OFDA, held in Washington, D.C. March 8-9, 1988. Funded by OFDA at \$50,000
Multilateral	USGS	Earch Sciences	86/10	Indef		Mineral deposit evaluation for the Pacific Trust Territories; resource assessment work on Guam and Saipan; funded by DOI at \$82,000
Multilateral	USGS	Earth Sciences	74/01	Indef	273	Circum-Pacific Map Project; coordination & cartographic preparations of about 60 thematic maps

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Multilateral	USGS	Earth Sciences	66/01	Indef		Acquisition of geodetic data; aerial photography; satellite imagery and production of maps; Operation of the Scientific Committee on maps; Operation of the Scientific Committee on Antarctic Research (SCAR) Library for Cartography & Geodesy. Funding at \$303,000 provided by the National Science Foundation
Multilateral	USGS	Earth Sciences	87/03	88/12		Famine Early Warning System (FEWS) Program; Application of Geographic Information System (GIS) to target populations at risk of famine in 8 sub-Sahara countries. AID funding of \$300,000
Multilateral	USGS	Earth Sciences	84/01	88/05		Comparative earthquake & tsunami potential for zones in the Circum-Pacific region; funded by USAID at \$55,000
Multilateral	USGS	Earth Sciences	87/10	88/02	13	Low frequency ice radar experiments in Antarctica. NSF funding at \$3,000

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Multilateral	USGS	Earth Sciences	86/01	Indef	40	Advisory consultations to intergovernmental geoscience bodies in e astern Asia, particularly in resource assessment methodologies; preparation of regional base maps at 1:2,000,000-scale; about \$5,000 in travel funds from the U.S. Department of State and \$5,000 from the International Union of Geological Sciences
Multilateral	USGS	Earth Sciences	86/08	91/07		Interagency Volcano Early Warning Disaster Assistance Program funded by USAID/IFDA and AID/Guatemala at \$2,000; provides for emergency response to volcano crises
Multilateral	USGS	Earth Sciences	74/01	Indef	50	Advisory coordination & training in the southwest and western Pacific; coastal geological hazards & resources; one USGS employee in residence in Fiji; USAID provides approximately \$8,000 in funding

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Multilateral	USGS	Earth Sciences	88/01	Indef	60	Int. Strategic Minerals Inventory: Global Inventory of Strategic Commodities including cobalt, nickel, platinum and titanium
Multilateral	USGS	Earth Sciences	88/01	88/12		USGS provides technical expertise to UN agencies as requested. In FY 1988: spectrographic analysis (Guayana); geothermal feasibility (Honduras); mineral resources study (Mozambique) marine geophysics (PRC); seismology field investigations (Peru); 1 water resources information systems and ground-water data study (India). UN agencies provided \$107,000
Multilateral	USGS	Earth Sciences	87/04	88/12		Grasshopper and locust habitat identification and monitoring in Chad, Mali, Mauritania, Niger, and Sudan. AID funding of \$270,000
Multilateral	USGS	Earth Sciences	87/11	88/02	44	Field research at lakes in dry valleys related to global carbon cycle in Antarctica. NSF funding at \$8,000

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Multilateral	USGS	Earth Sciences	72/01	Indef		Antarctic ice cap motion studies; seismology investigations and data telecommunications at the South Pole. Funding of \$150,000 by DMA
Multilateral	USGS	Earth Sciences	82/09	88/09	5	Offshore exploration for petroleum resources in the southwest Pacific
Multilateral	USGS	Earth Sciences	88/03	88/03	23	Marine geology course and workshop sponsored by USGS and Gov't of Chile, March 3-19, 1988. Funded by GOC at \$13,000. Mineral Deposit Modeling Workshop held in Chile 11/5-20/87, UNESCO funded \$2,400
Multilateral	USGS	Earth Sciences	88/04	88/07		Identify remote sensing data requirements for AGRHYMET agricultural assessments in 9 west African countries. AID funding of \$120,000
Multilateral (EC)	DOE	Energy	86/07	91/07		Cooperation in research & development related to radiation protection

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Multilateral (EC)	DOE	Energy (Fusion)	86/12	96/12		Cooperation with EURATOM to develop scientific & technological understanding of a magnetic fusion power system
Multilateral (EC)	DOE	Energy (Nuclear)	82/10	92/10		Exchange of information on the management of radioactive waste, i.e., characterization of waste forms & disposal in geologic formations
Multilateral (EC)	DOE	Energy (Renewable)	82/12	99/12		Exchange of information on thermal solar power stations, photovoltaic energy production & energy production from biomass
Multilateral (ESA)	NASA	Space & Aeronautics	77/10	Indef	96	Cooperative participation in development & use of the Hubble Space Telescope
Multilateral (ESA)	NASA	Space & Aeronautics	88/09	Indef	rmk	Entering Phase C/D of Space Station Program; Detailed Design and Development; total funding with all international partners in excess of \$7.0 billion, ESA hardware accounting for \$4 billion
Multilateral (ESA)	NASA	Space & Aeronautics	79/03	Indef	10	Ulysses; cooperative mission to study the poles of the sun

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Multilateral (ESA)	NASA	Space & Aeronautics	86/01	Indef	nb	Agreement for tracking & data reception for the ESA Earth Remote Sensing Satellite (ERS-1)
Multilateral (ESA)	NOAA	Space Technologies	84/02	Indef		MOU for direct reception & distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 & Landsat-5
Netherlands	DOT	Transportation	09/77	Indef	nb	Transportation economics studies; highway traffic safety; civil aviation; urban systems
Netherlands	EPA	Environment	79/01	Indef	nb	Self-renewing MOU between EPA and the Ministry of Housing, Physical Planning, and Environment. Covers the same broad range of topics as the US-FRG agreement. EPA and the Ministry co-sponsored a major international symposium on ozone, the third in a series of triennial symposia on major air-related issues
Netherlands	HHS	Food Sciences	78/03	Indef		Dry milk products; FDA MOU recognizes certificate of analysis from government authorities

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Netherlands	NRC	Nuclear Safety	82/09	87/09	nb	Information exchange; agreement extension is awaiting signature
Netherlands	NRC	Nuclear Safety	83/02	91/8	nb	Severe accident research
Netherlands	USDA	Agricultural Science	85/11	90/11	20	Agricultural S&T; market and policy economic research; soil and water science; integrated pest management
New Zealand	HHS	Food & Drug Reg	75/11	Indef		FDA MOU covering dry milk products certification for export to the U.S.
New Zealand	HHS	Food & Drug Reg	80/10	Indef		MOU; shellfish sanitation & certification for export to U.S.; annual inspection of growing areas & processing facilities
New Zealand	NSF	Basic Sciences	74/02	89/02	96	Projects under S&T umbrella agreement; joint research; information & personnel exchanges; utilization of installations
New Zealand	US Gov	S&T Umbrella	74/02	89/02		Agreement for scientific & technological cooperation; individual cooperating agencies negotiate funding with counterpart agencies

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
New Zealand	USDA	Agricultural Science	83/11	88/11	2	Agricultural R&D; tree improvement; animal diseases surveillance systems
New Zealand	USGS	Earth Sciences	86/01	90/12		Joint USGS-New Zealand project to do 1:50,000 scale mapping of regions of high scientific interest in McMurdo Sound area of Antarctica; funded by NSF at \$50,000. USGS completed its work on the first 5 sheets which were sent to New Zealand for compilation
Norway	DOE	Energy (Fossil)	87/03	91/03		Exchange information & conduct joint fossil energy research projects
Norway	HHS	Food & Drug Reg.	82/02	Indef		MOU; FDA recognizes certificate of analysis from government authorities for dry milk products
Norway	NASA	Space & Aeronautics	75/07	Indef	nb	Agreement for sounding rocket launches from Andoya, Norway
Norway	USGS		88/05	88/09	17	Study soil genesis and weathering to assess hydrochemical weathering variations in watersheds. P.L. 97-256 (Fulbright-Hayes funded at \$7,000)

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Norway	USGS	Earth Sciences	87/01	88/12	150	Joint research project to develop methods for processing digital sonar image data. Gov't of Norway funds its own personnel participating in the project
Pakistan	BReclam	Natural Resources	84/04	89/04		Technical assistance in the design & construction of irrigation drainage systems; reclamation of saline & waterlogged agricultural lands; funding by the World Bank of \$1.8 million
Pakistan	FWS	Natural Resources	78/01	92/12	500 sfc	Research in endangered species; training in wildlife management; conservation education
Pakistan	NOAA	Space Technologies	84/11	Indef		MOU for direct reception & distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 & Landsat-5
Pakistan	NPS	Natural Resources	Ongoing	Ongoing	101	Technical assistance & training; national/cultural heritage conservation & management technical assistance; wildlife conservation training; other funding of \$150,000

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Pakistan	NSF	Basic Sciences	81/03	89/05	432	Cooperative Science Program MOU with the Pakistan Ministry of S&T; joint research, seminars & workshops; visits; supports attendance at international meetings; information & data exchanges; translation services
Pakistan	NSF	Basic Sciences	82/12	Indef		Cooperative Science Program under the U.S.-Pakistan Subcommission on S&T; limited activity during FY 1988
Pakistan	US Gov	S&T Umbrella	82/12	Indef		Agreement to establish a Joint Commission on economic, commercial, scientific, technological, educational & cultural cooperation

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Pakistan	USGS	Energy	85/08	89/07		Four-year \$5 million program for coal resources exploration & assessment, national coal exploration plan, coal analytical lab. system, geodata center, and institutional modernization of Geological Survey of Pakistan. In FY 88 funded at \$496,600 by USAID
Panama	USGS	Earth Sciences	86/08	89/07		Earthquake hazards mitigation program; funded by AID/OFDA at \$47,000
Papua New Guinea	USGS	Earth Sciences	84/01	Indef	8	Mineral resource assessment program; Geological Survey of Papua New Guinea provides travel funds for USGS consultants
Philippines	HHS	Biomedical Sciences	87/06	89/12	265	Centers for Disease Control and Dept. of Health program in field epidemiology training (USAID funded)
Philippines	HHS	Food & Drug Reg.	86/09	Indef		MOU signed 09/86 covering certification of selected foods for export to the U.S.
Philippines	NRC	Nuclear Safety	85/08	90/08	nb	Thermal hydraulic research
Philippines	NRC	Nuclear Safety	85/06	90/06	nb	Information exchange

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Philippines	USDA	Agricultural Science	88/02	93/02	3	Agricultural S&T; cocoa production technology
Poland	DOT	Transportation	78/11	Indef	nb	Transportation agreement carried out, and projects funded under the 1987 US-Poland S&T agreement. Special interests are rail safety and highway basic science R&D
Poland	EPA	Environment	87/09	93/09		Agreement between EPA and the Ministry of Environment which may cover air & water pollution, hazardous waste management, effects of pollutants on flora & fauna, radiation, health effects of pollutants & environmental management & planning. EPA also participates in the US-Poland agreement on S&T Cooperation, and is developing projects on health effects, radiation, and hazardous waste management

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Poland	HHS	Biomedical Sciences	84/10	Indef	294	Agreement between HHS & the Polish Ministry of Health & Social Welfare; cooperation on mental health problems; cardiovascular & pulmonary diseases, individual health scientist exchanges, cancer research & mental health
Poland	NOAA	Fisheries	77/02	91/07		Governing International Fishery Agreements established on a bilateral basis, conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. Exclusive Economic Zone
Poland	NOAA	Marine Science	74/10	Indef		Cooperative research on ecosystem dynamics, stock assessment methodology, and resource analysis in the Antarctic and northwest Atlantic
Poland	NPS	Natural Resources	87/09	92/09	50 sfc	Cooperation & exchange; natural & cultural heritage conservation & management; personnel; information exchange

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Poland	NSF	Basic Sciences	88/06	93/06		MOU under the new S&T umbrella agreement provides for joint research, seminars and workshops
Poland	US Gov	S&T Umbrella	87/09	92/09		Agreement established a joint commission and a joint fund with contributions from both sides after lapse of an earlier agreement signed in 1972; extensive language on protection of intellectual property
Portugal	USGS	Earth Sciences	87/04	92/04	32	Funded by the LUSO-American Foundation for \$43,000; massive sulfide deposit studies in the Iberian Pyrite Belt during 1986-1989
Regional (Africa)	DOT	Transportation	Variable	Variable	cr	Regional highway technical assistance; transport planning & development in cooperation with USAID
Regional (Africa)	DOT	Transportation	Variable	Variable	cr	Civil aviation technical assistance in Cape Verde, Egypt, Liberia, & Morocco
Regional (Asia)	DOT	Transportation	Variable	Variable	cr	Technical assistance to Saudi Arabia on transport system infrastructure establishment and training

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Regional (Asia)	DOT	Transportation	Variable	Variable	cr	Highway technical assistance in Kuwait
Regional (Asia)	DOT	Transportation	Variable	Variable	cr	Civil aviation technical assistance in China, Hong Kong, Indonesia, Japan, Jordan, Korea, Marshall Islands, Malaysia, Micronesia, Nepal, Oman, Pakistan, Palau, Saudi Arabia, Sri Lanka, and Taiwan
Regional (Europe)	DOT	Transportation	Variable	Variable	cr	Civil aviation technical assistance in Austria, Belgium, Denmark, the FRG, France, Greece, Ireland, Israel, the Netherlands, Poland, Portugal, Spain, Switzerland, the United Kingdom
Regional (Oceania)	DOT	Transportation	Variable	Variable	cr	Civil aviation technical assistance in Brunei, Indonesia, & New Zealand
Regional (Oceania)	DOT	Transportation	Variable	Variable	cr	Highway technical assistance in Indonesia
Regional (S America)	DOT	Transportation	Variable	Variable	cr	Civil aviation technical assistance in Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Surinam, Uruguay, & Venezuela

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Regional (W Hemis)	DOT	Transportation	Variable	Variable	cr	Highway technical assistance in Barbados & Costa Rica
Regional (W Hemis)	DOT	Transportation	Variable	Variable	cr	Civil aviation technical assistance in Barbados, Bahamas, Canada, Cayman Islands, COCESNA, Dominican Republic, Grenada, Haiti, Iceland, Jamaica, Mexico, Netherlands Antilles, Panama, Trinidad & Tobago & Turks and Caicos Islands
Romania	DOT	Transportation	71/11	Indef	nb	Cuurently inactive
Romania	HHS	Biomedical Sciences	74/12	Indef		U.S.-Romania cooperation & individual health scientist exchanges; renewable every two years
Romania	NOAA	Fisheries	78/01	88/12		Governing International Fishery Agreements established on a bilateral basis, conditions under which foreign fishing vessels are granted access to fishery resources within the U.S. Exclusive Economic Zone Romania never signed the renegotiated GIFA
Romania	NSF	Basic Sciences	79/02	88/02		Joint workshops & seminars; short-term project development visits; joint research. Renewal pending

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Saudi Arabia	BReclam	Natural Resources	79/11	90/02		Technical assistance in the development of land & water resources; desalinization application & research; institution building; funding by Saudi Arabia of \$402,000
Saudi Arabia	DOE	Energy (renewable)	87/02	92/02		Finding solutions to mutually agreed on problems in renewable energy research & development
Saudi Arabia	HHS	Biomedical Sciences	86/10	93/12	146	CDC field epidemiology training program
Saudi Arabia	HHS	Biomedical Sciences	74/09	90/09		Under U.S.-Saudi Joint Commission economic cooperation to enable sharing of knowledge & transfer of technology for food & drug control & emergency medical services
Saudi Arabia	NASA	Space & Aeronautics	83/10	Indef	nb	Cooperative S&T studies & projects, particularly in remote sensing
Saudi Arabia	NOAA	Atmospheric Sciences	75/02	90/02		Technical Cooperation Agreement; cooperation in integrating Saudi meteorological services & supporting research programs

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Saudi Arabia	NOAA	Space Technologies	84/09	Indef		MOU for direct reception & distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 & Landsat-5
Saudi Arabia	NSF	Basic Sciences	79/06	89/10	574	"Umbrella" project agreement in conjunction with the U.S. Treasury Dept; institutional development; development of a national S&T information system, grants program & a national research institute; science education
Saudi Arabia	USGS	Earth Sciences	63/01	90/12		Establishment of an earth sciences organization with staff, facilities, & procedures development; geographic & geologic cartography; mining; geologic, geochemical & geophysical studies; geologic & mineral resources database; \$4.8 million from Saudi Arabia in FY 1988
Senegal	NASA	Space & Aeronautics	83/01	88/01	nb	Use of Dakar airport for Shuttle emergency landing
Senegal	US Gov	S&T Umbrella	82/08	87/08		Agreement for scientific & technological cooperation

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Sierra Leone	HHS	Biomedical Sciences	82/01	Indef		Long-term agreement between Centers for Disease Control and Ministry of Health in joint research for viral haemorrhagic fevers
South Africa	NOAA	Space Technologies	83/10	Indef		MOU for direct reception & distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 & Landsat-5
Spain	BReclam	Natural Resources	84/10	89/10		Information exchanges & joint research; river basin modeling; irrigation design & operation; funding by Spain of \$50,000
Spain	DOE	Energy	85/12	99/12		Joint evaluation & funding of proposals & projects in the field of energy
Spain	DOE	Energy	86/10	99/10		Provide funding for study of electron-positron collision interactions
Spain	DOE	Energy (Fossil)	86/06	91/06		Cooperate in R&D pertaining to coal gasification technologies
Spain	DOE	Energy (Fusion)	85/12	88/12		Cooperation in toroidal confinement devices

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Spain	DOE	Energy (Nuclear)	85/12	88/12		Cooperation in probabilistic risk assessment for light water reactors
Spain	DOT	Transportation	71/11	Indef	nb	Transportation planning exchanges; concrete structure research; seismic effects on bridge deck systems; two projects are funded under the US-Spain Agreement of Friendship, Defense & Cooperation, & are carried out by US universities
Spain	HHS	Biomedical Sciences	83/01	88/12		Cooperative biomedical and alcohol research projects supported under the provisions of Complementary Agreement Seven of the Agreement on Friendship, Defense & Cooperation between the U.S. and Spain
Spain	NASA	Space & Aeronautics	84/08	Indef	nb	Use of Spanish airspace for Shuttle emergency landing
Spain	NOAA	Marine Science	83/05	88/05	20	Sardine Anchovy Recruitment Program conducted under the U.S/Spain bilateral science and technology agreement.

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Spain	NPS	Natural Resources	84/05	88/05	5	Technical assistance; US-Spain Friendship Agreement; Spanish colonial archives research & inventory; other funding of \$85,000
Spain	NRC	Nuclear Safety	84/09	89/09	nb	Information exchange
Spain	NRC	Nuclear Safety	85/11	90/11	nb	Nuclear reactor safety
Spain	NSF	Basic Sciences	70/07	88/05	350	Projects under Agreement of Friendship, Defense & Cooperation; joint research, seminars & workshops; lack of funding caused a temporary hold on projects during FY 1987. These awards pending under the program were funded in FY 1988. The program is now closed

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Spain	US Gov	S&T Umbrella	84/05	88/05	rmk	The US-Spain Agreement of Friendship, Defense & Cooperation under which a Complementary Agreement on Culture & Education and Science & Technology and functions, expired May 1988; rights and obligations continue for 1 year; \$1.75 million in FY88 ESF funds were allocated to Spain for purpose of completing ongoing projects & terminating all activities; approximately \$5.5 million from previous years' allocations remain; US & Spanish negotiators of new security agreement have agreed that a new S&T/C&E agreement should be negotiated at the same time; clearance on language proceeding

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Spain	USGS	Earth Sciences	70/07	Indef	75	Projects under the Agreement of Friendship with funding of \$64,000; 8 projects in water geochemistry & flow systems, remote sensing for mineral deposits, earthquake research, marine geology of continental margins, water resources/pollution management, gold resources, mercury resources & hydrochemical studies in the Canary Islands
Sri Lanka	NPS	Natural Resources	84/06	90/06		Training & technical assistance; Mahaweli protected area management; USAID funding of \$500,000
Sri Lanka	US Gov	S&T Umbrella	84/06	90/06		Agreement on cooperation in science & technology
Sweden	DOE	Energy (Nuclear)	80/09	90/12		Exchange information in radioactive waste management, particularly in the assessment of rock formations for terminal storage

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Sweden	EPA	Environment	70/01	Indef	nb	Bilateral cooperation between EPA and the National Environmental Protection Board has gone on successfully since 1970 without any formal framework; principal subjects are acid deposition effects research & research on the health effects of pollutants
Sweden	HHS	Biomedical Science ^{es}	68/10	Indef		National Library of Medicine MEDLARS Agreement with Karolinska Institute; quid pro quo interlibrary exchange
Sweden	HHS	Biomedical Science ^{es}	79/05	Indef		FDA MOU; agreement to implement good laboratory practices
Sweden	HHS	Food & Drug Reg.ce ^{es}	72/10	Indef		FDA MOU; mutual acceptance of drug inspection reports on good manufacturing practices
Sweden	HHS	Food Sciences	78/01	Indef		MOU; FDA recognizes certificate of analysis from government authorities on dry milk
Sweden	NASA	Space & Aeronautic ^{cs}	73/08	Indef	nb	Agreement for sounding rocket launches from Esrange, Sweden
Sweden	NRC	Nuclear Safety	87/03	90/03	nb	International piping integrity research

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Sweden	NRC	Nuclear Safety	85/02	88/02	nb	Thermal hydraulics; extension under negotiation
Sweden	NRC	Nuclear Safety	87/01	90/12	nb	Severe accident research
Sweden	NRC	Nuclear Safety	75/01	90/01	nb	Information exchange
Sweden	NSF	Basic Sciences	81/10	89/10	136	Letter of Agreement for joint research, seminars, workshops & scientific exchanges with the National Science Research Council of Sweden
Switzerland	DOE	Energy (Nuclear)	85/04	90/04		Study of mutually agreed topics associated with the management of nuclear waste & related activities of the nuclear fuel cycle
Switzerland	DOE	Energy (Nuclear)	82/11	90/11		Irradiation of fuel pellets in the DOE Fast Flux Test Facility
Switzerland	HHS	Biomedical Sciences	80/01	Indef		National Library of Medicine MEDLARS Agreement with the Documentation Service of the Swiss Academy of Medical Sciences; quid pro quo interlibrary exchange
Switzerland	HHS	Food & Drug Reg.	85/04	Indef		FDA MOU; mutual acceptance of non-clinical laboratory inspection reports and good laboratory practices

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Switzerland	HHS	Food & Drug Reg.	68/10	Indef		FDA MOU; mutual acceptance of drug inspection reports relating to good manufacturing practices
Switzerland	NRC	Nuclear Safety	86/09	91/09	nb	Radioactive waste management safety
Switzerland	NRC	Nuclear Safety	84/05	88/05	nb	Thermal hydraulic transients and ECCS REFLOOD program; extension being negotiated
Switzerland	NRC	Nuclear Safety	87/03	90/03	nb	International piping integrity research
Switzerland	NRC	Nuclear Safety	87/06	91/06	nb	Severe accident research
Switzerland	NRC	Nuclear Safety	83/07	87/07	nb	Heavy section steel technology program & research program in fracture mechanics of the Swiss Federal Institute for Reactor Research; extension to be negotiated
Switzerland	NRC	Nuclear Safety	82/08	87/08	nb	Information exchange; renewal agreement is awaiting signature
Switzerland	NSF	Basic Sciences	78/11	88/11	104	Visits, personnel exchanges & fellowships; joint seminars, workshops & research

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Thailand	BReclam	Natural Resources	88/04	90/07		Development assistance in weather modification programs to increase natural water supplies; funding by USAID of \$250,000
Thailand	HHS	Biomedical Sciences	84/04	89/04		NIH activity under S&T Agreement for aplastic anemia
Thailand	NOAA	Space Technologies	85/09	Indef		MOU for direct reception & distribution of Landsat data at Landsat ground station; extends through the life of Landsat-4 & Landsat-5
Thailand	NPS	Natural Resources	84/04	89/04	10	Training & technical assistance in national parks; USAID funding of \$53,000
Thailand	US Gov	S&T Umbrella	84/04	89/04		Agreement on cooperation in science & technology; individual cooperating agencies negotiate funding with counterpart agencies
Thailand	USDA	Agricultural Science	84/06	89/06	12	Agricultural development; human nutrition; soil conservation techniques; post-harvest techniques for tropical fruits and vegetables

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Turkey	NSF	Basic Sciences	83/06	88/10	76	NOU under S&T umbrella agreement provides for joint research, seminars. In FY 1988 NSF and Tubitak (National Council for S&T) of Turkey reached agreement on cooperative program in earthquake engineering
Turkey	US Gov	S&T Umbrella	83/10	88/10		Agreement for scientific & technological cooperation; formal consideration of a new agreement is in process; currently there is minimal activity under the agreement; individual cooperating agencies negotiate funding with counterpart agencies
Turkey	USDA	Agricultural Science	85/11	90/04	4	Agricultural S&T; joint activities FY 1988 included the First World Walnut Conference
USSR	Army/COE	Building Technology	87/04	92/04		Participation under the direction of the Dept. of Defense in the U.S.-USSR Joint Committee on housing in the field of housing and construction
USSR	DOE	Energy (Fusion)	83/06	89/06		General cooperation in high energy physics

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
USSR	DOE	Energy (Fusion)	83/06	89/06		Cooperation in various phases of fusion research
USSR	DOE	Engery (Nuclear)	83/06	88/06		Exchange of information, personnel & equipment in the field of peaceful uses of nuclear energy
USSR	DOT	Transportation	88/05	93/05	nb	Government-to-government agreement for cooperation in transportation S&T. DOT is Executive Agent
USSR	DOT	Transportation	88/05	Indef	nb	Government-to-government agreement on establishment of joint (maritime) radio navigation system
USSR	DOT	Transportation	88/05	Indef	nb	Government-to-government agreement on maritime search and rescue

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
USSR	EPA		72/00	Indef		EPA and the new (1988) State Committee for Environmental Protection (GOSKOMPRIRODA), which incorporates the environmental responsibilities of GOSKOMGIDROMET, are the executive agencies for this intergovernmental agreement. Joint activities cover the areas of air and water, pollution, agricultural pollution, urban environments and park management, nature protection, marine pollution, biological and genetic effects of pollution, earthquake prediction, legal and administrative measures, and environmental education

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
USSR	EPA	Environment	72/05	Indef	nb	EPA & the GOSKONGIDROMET are lead agencies for this self-renewing governmental agreement; projects cover the areas of air & water pollution, urban environments & park management, nature protection, pollution associated with agricultural practices, marine pollution, environmental effects on climate, earthquake prediction, environmental education & legal & administrative measures
USSR	FWS	Natural Resources	72/05	Indef	15	Exchange of scientists to work on activities relative to endangered species
USSR	HHS	Biomedical Sciences	72/05	92/05	344	Under government-to-government health agreement on cancer, cardiovascular disease, environmental health, arthritis, biomedical communication, eye disease & individual health scientist exchange
USSR	HHS	Biomedical Sciences	74/06	92/06		Under government-to-government agreement on artificial heart research & development

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
USSR	NASA	Space & Aeronautics	87/04	Indef	nb	Cooperation in 5 areas of space science and applications. Exchange of notes in May extended the 1987 US-USSR Civil Space Agreement to include opportunities to fly scientific instruments on each other's spacecraft and exchange results of independent studies on solar system exploration
USSR	NIST	Metrology	78/12	88/12	nb	Cooperation with the USSR Academy of Sciences in thermal physics & thermodynamics, materials science, spectroscopy, chemistry & chemical kinetics, & cryogenic science; exchange of scientists; information & documentation exchanges; joint meetings & seminars; joint research; exchanges are on a receiving-side-pays basis
USSR	NOAA	Atmospheric Science	72/05	92/05	60	Agreement on Cooperation in the Field of Environmental Protection; exchange of scientists, information exchange, and joint research on influence of environmental changes on climate

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
USSR	NOAA	Marine Science	73/06	87/12		Agreement on Cooperation in Studies of the World Oceans; currently no cooperative activities
USSR	NPS	Natural Resources	72/05	92/05	8	US-USSR Environmental Agreement; information exchange; professional delegation visits to each country; other funding of \$24,000
USSR	USDA	Agricultural Science	73/06	Indef	2	Agricultural S&T; joint Working Group met in Washington in 09/87; joint committee met in Washington in 01/88. Six U.S. teams to USSR in FY 1988
USSR	USGS	Earth Sciences	72/01	Indef	130	USSR, DOE & DOD funding of \$124,600; joint projects in predicting earthquakes, estimating seismic risk & understanding seismic sources; studies on marine mineral resources; climate change; Joint Verification Experiment and nuclear testing talks for exchange of geologic data and discussions on expanded cooperation.

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
United Arab Emirates	USGS	Earth Sciences	88/02	92/02		An assessment of the ground-water resources of Abu-Dhabi; funded by Abu Dhabi Emirate at \$6 million. In FY 1988 funded at \$200,000
United Kingdom	DOE	Energy (Fossil)	84/10	89/10		Exchange of information with the UK National Coal Board
United Kingdom	DOE	Energy (Nuclear)	76/09	87/12		A balanced exchange of liquid metal fast breeder reactor technology in such areas as reactor safety, neutronics analysis, etc., being renegotiated to include FRG, France, Italy and Belgium
United Kingdom	DOE	Energy (Nuclear)	86/10	91/10		Exchange of technology for management of radioactive waste
United Kingdom	DOE	Energy (Nuclear)	85/03	89/03		Exchange of technology & experience in decommissioning nuclear facilities
United Kingdom	DOT	Transportation	81/11	87/11	nb	Original agreement extended from 7/86 to 11/87; general transport system planning exchanges; civil aviation security
United Kingdom	HHS	Biomedical Sciences	86/06	Indef		FDA MOU; acceptance of medical device inspection reports

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
United Kingdom	HHS	Biomedical Sciences	68/01	Indef		National Library of Medicine MEDLARS Agreement with the British Library; quid pro interlibrary exchange
United Kingdom	HHS	Food & Drug Reg.	80/09	Indef		FDA MOU; establishes type of procedures to assure safe imported shellfish
United Kingdom	HHS	Food & Drug Reg.	88/03	93/03		FDA/EPA MOU with Dept. of Health and Social Security reciprocal recognition of Laboratory Practice program (GLP)
United Kingdom	NASA	Space & Aeronautics	82/08	Indef	3	Cooperative participation in Rosat x-ray survey satellite
United Kingdom	NASA	Space & Aeronautics	Indef	Indef	nb	Flight of British payload specialist on STS
United Kingdom	NASA	Space & Aeronautics	84/03	Indef	114	Cooperative participation in Upper Atmospheric Research Satellite, including ozone monitoring
United Kingdom	NOAA	Space Technologies	86/02	94/02		United Kingdom will provide an Advanced Microwave Sounding Unit (AMSU) for flight on future NOAA spacecraft
United Kingdom	NOAA	Space Technologies	74/09	89/09		United Kingdom provides the Stratospheric Sounding Unit (SSU) for flight on NOAA satellites

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
United Kingdom	NRC	Nuclear Safety	84/08	87/08	nb	Studies by the systems reliability service; extension under review
United Kingdom	NRC	Nuclear Safety	86/04	91/04	nb	Information exchange
United Kingdom	NRC	Nuclear Safety	85/02	90/02	nb	Modeling of loss of coolant accidents (LOCA)
United Kingdom	NRC	Nuclear Safety	86/10	92/01	nb	Severe accident research
United Kingdom	NRC	Nuclear Safety	82/08	92/08	nb	Nuclear safety R&D; new agreement under review
United Kingdom	NSF	Basic Sciences	80/05	Indef	178	Exchange of letters with no formal agreement; joint workshops & research; long-term research visits
United Kingdom	USGS	Earth Sciences	85/01	88/12		Joint USGS/NOAA/U.K. remote sensing image mapping project of Antarctica at 1:5 million scale; funded by NSF at \$20,000. UK has completed digital image processing; USGS is evaluating the data and preparing plans to print the product
United Kingdom	USGS	Earth Sciences	84/01	89/12	4500	Seafloor sonar imaging surveys using the Geologic Long-Range Inclined Asdic (GLORIA) system

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COUNTRY	AGENCY	SUBJECT AREA	ENTR INTO FORCRY (Y/MO CE 88/0M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Various S.Pacific	FWS	Natural Resources	00	91/06	1.5	Partial support for an inventory of wetlands of international importance in the South Pacific in support of the wetlands convention
Venezuela	DOE	Energy	Vari ied			Under the umbrella research and development agreement with Venezuela, the DOE has executed eight project agreements in the areas of enhanced oil recovery, coal technology and geochemistry
Venezuela	DOE	Energy	80/0 06	88/06		General bilateral agreement for the purpose of establishing wider cooperation in the field of energy research & development
Venezuela	DOE	Energy (Renewable)	88/0 02	90/02		Cooperate in energy R&D in the area of energy conservation
Venezuela	NSF	Basic Sciences	83/0 07	88/07	24	Projects under S&T umbrella agreement; information & personnel exchanges; joint research, seminars, workshops, & meetings
Venezuela	US Gov	S&T Umbrella	83/0 07	88/07		Agreement for scientific & technological cooperation; individual cooperating agencies negotiate funding with counterpart agencies

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Venezuela	USDA	Agricultural Science	83/07	88/07	18	Joint studies on vampire bats & cattle performance
Venezuela	USGS	Earth Sciences	87/02	92/02		Geologic mapping & mineral resources assessment of the Guyana shield; funding provided by Venezuela at \$279,000
Venezuela	USGS	Earth Sciences	88/06	88/07	4	Examine processes controlling erosion rates and the composition of sediments in the Orinoco River. NSF funding at \$5,500
Yugoslavia	DOT	Transportation	80/06	Indef	nb	DOT participates in cooperation program and funding of research, under US-Yugoslav S&T agreement
Yugoslavia	EPA	Environment	87/00	93/00		EPA supports the US-Yugoslav agreement on scientific and technical cooperation with 20 active projects in such areas as health effects research, emissions from stationary and mobile sources, ecological research, and hazardous waste management

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APPENDIX III.

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

FUNDING BY COUNTRY

AGENCY FOR INTERNATIONAL DEVELOPMENT
BUREAU FOR SCIENCE AND TECHNOLOGY
FUNDING EXPENDITURE BY COUNTRY (\$000)

COUNTRY	SUBJECT	FY 1987 FUNDING	FY 1988 FUNDING
AFRICA REGIONAL	AGRICULTURE	70	10
AFRICA REGIONAL	ENERGY	20	127
AFRICA REGIONAL	FORESTRY & ENVR NAT RES	18	50
AFRICA REGIONAL	HEALTH	34	
AFRICA REGIONAL	INTL TRAINING	84	
AFRICA REGIONAL	POPULATION	3823	2718
AFRICA REGIONAL	RURAL & INSTITUTIONAL DEV		20
ALGERIA	POPULATION	11	20
ANTIGUA	FORESTRY & ENVR NAT RES	2	
ANTIGUA	POPULATION	3	1
AREA DEVELOPMENT OFFICE - NIAMEY	EDUCATION	1	10
AREA DEVELOPMENT-DAKAR	EDUCATION		2
ARGENTINA	AGRICULTURE	4	
ARGENTINA	FORESTRY & ENVR NAT RES	2	
ARGENTINA	POPULATION	41	44
ASIA NEAR EAST REGIONAL	EDUCATION		3
ASIA NEAR EAST REGIONAL	POPULATION	1889	736
ASIA REGIONAL	INTL TRAINING	84	
BAHAMAS	POPULATION		1
BAHRAIN	POPULATION	1	2
BANGLADESH	AGRICULTURE	13	40
BANGLADESH	ENERGY		100
BANGLADESH	FORESTRY AND ENVR NAT RES	100	100
BANGLADESH	HEALTH	265	38
BANGLADESH	INTL TRAINING	7	
BANGLADESH	NUTRITION	521	450
BANGLADESH	POPULATION	2041	1745
BANGLADESH	RURAL & INSTITUTIONAL DEV	82	95
BARBADOS	AGRICULTURE	21	5
BARBADOS	FORESTRY & ENVR NAT RES	2	
BARBADOS	HEALTH	30	
BARBADOS	INTL TRAINING	7	
BARBADOS	POPULATION	364	204
BARBADOS	RURAL & INSTITUTIONAL DEV	3	
BELIZE	EDUCATION	124	106
BELIZE	ENERGY		5
BELIZE	FORESTRY & ENVR NAT RES	5	16
BELIZE	HEALTH	38	18
BELIZE	NUTRITION	3	
BELIZE	POPULATION	132	49
BELIZE	RURAL & INSTITUTIONAL DEV	20	
BENIN (DAHOMEY)	AGRICULTURE	7	
BENIN (DAHOMEY)	HEALTH	30	25
BENIN (DAHOMEY)	POPULATION	177	79
BHUTAN	AGRICULTURE	53	4

COUNTRY	SUBJECT	FY 1987 FUNDING	FY 1988 FUNDING
BOLIVIA	AGRICULTURE	14	25
BOLIVIA	EDUCATION	65	100
BOLIVIA	ENERGY		24
BOLIVIA	FORESTRY & ENVR NAT RES	17	13
BOLIVIA	HEALTH	268	155
BOLIVIA	NUTRITION	46	122
BOLIVIA	POPULATION	1011	1778
BOLIVIA	RURAL & INSTITUTIONAL DEV	9	45
BOLIVIA	RESEARCH & UNIVERSITY REL	30	
BOTSWANA	AGRICULTURE	357	173
BOTSWANA	EDUCATION	184	168
BOTSWANA	ENERGY	150	
BOTSWANA	FORESTRY & ENVR NAT RES		27
BOTSWANA	HEALTH	194	118
BOTSWANA	NUTRITION	87	75
BOTSWANA	POPULATION	149	391
BOTSWANA	RURAL & INSTITUTIONAL DEV	27	6
BRAZIL	AGRICULTURE	740	521
BRAZIL	FORESTRY & ENVR NAT RES	6	
BRAZIL	HEALTH		14
BRAZIL	NUTRITION		88
BRAZIL	POPULATION	7217	4758
BURKINA	AGRICULTURE	53	89
BURKINA	HEALTH	25	98
BURKINA	NUTRITION		3
BURKINA	POPULATION	706	429
BURKINA	RURAL & INSTITUTIONAL DEV	1	
BURMA	AGRICULTURE	7	5
BURMA	ENERGY		
BURMA	FORESTRY & ENVR NAT RES	119	100
BURMA	HEALTH	5	10
BURMA	POPULATION	66	84
BURUNDI	AGRICULTURE	11	10
BURUNDI	EDUCATION	64	90
BURUNDI	ENERGY	8	17
BURUNDI	FORESTRY & ENVR NAT RES		53
BURUNDI	HEALTH	462	256
BURUNDI	POPULATION		
CAMEROON	AGRICULTURE	63	51
CAMEROON	EDUCATION		4
CAMEROON	FORESTRY & ENVR NAT RES	14	
CAMEROON	HEALTH	135	195
CAMEROON	NUTRITION	80	60
CAMEROON	POPULATION	188	387
CAMEROON	RURAL & INSTITUTIONAL DEV	70	457
CAMEROON	RESEARCH & UNIVERSITY REL	241	
CAPE VERDE	AGRICULTURE	5	
CAPE VERDE	EDUCATION	6	
CAPE VERDE	POPULATION	21	3
CEN. AFRICAN REP.	HEALTH	24	24
CEN. AFRICAN REP.	POPULATION	48	127
CEN. AFRICAN REP.	RURAL & INSTITUTIONAL DEV	2	1
CHAD	AGRICULTURE	26	8
CHAD	FORESTRY AND ENVR NAT RES	2	
CHAD	HEALTH	30	8
CHAD	POPULATION	49	10
CHAD	RURAL & INSTITUTIONAL DEV	3	1

COUNTRY	SUBJECT	FY 1987 FUNDING	FY 1988 FUNDING
CHILE	AGRICULTURE	4	
CHILE	NUTRITION	25	10
CHILE	POPULATION	948	594
COLOMBIA	AGRICULTURE	124	118
COLOMBIA	FORESTRY & ENVR NAT RES	22	11
COLOMBIA	HEALTH	265	94
COLOMBIA	POPULATION	4661	3497
COLOMBIA	RURAL & INSTITUTIONAL DEV	47	10
COMOROS	POPULATION	37	3
CONGO, REP. OF	HEALTH	13	7
CONGO, REP. OF	POPULATION	22	8
COSTA RICA	AGRICULTURE	107	122
COSTA RICA	EDUCATION		20
COSTA RICA	ENERGY	212	249
COSTA RICA	FORESTRY AND ENVR NAT RES	107	126
COSTA RICA	HEALTH	406	413
COSTA RICA	NUTRITION	9	20
COSTA RICA	POPULATION	260	297
COSTA RICA	RURAL & INSTITUTIONAL DEV	91	191
COSTA RICA	RESEARCH & UNIVERSITY REL	12	
CYPRUS	AGRICULTURE	6	
CYPRUS	POPULATION	1	1
DJIBOUTI	AGRICULTURE		10
DJIBOUTI	ENERGY	15	25
DJIBOUTI	HEALTH	3	16
DJIBOUTI	POPULATION	3	2
DOMINICAN REPUBLIC	AGRICULTURE	175	104
DOMINICAN REPUBLIC	EDUCATION	40	
DOMINICAN REPUBLIC	ENERGY	58	202
DOMINICAN REPUBLIC	FORESTRY & ENVR NAT RES	8	3
DOMINICAN REPUBLIC	HEALTH	98	319
DOMINICAN REPUBLIC	INTL TRAINING	7	
DOMINICAN REPUBLIC	NUTRITION	60	5
DOMINICAN REPUBLIC	POPULATION	1449	1467
DOMINICAN REPUBLIC	RURAL & INSTITUTIONAL DEV	26	95
DOMINICAN REPUBLIC	RESEARCH & UNIVERSITY REL	46	
EAST ASIA INVENTORY	HEALTH	7	5
EAST CARIBBEAN REG.	AGRICULTURE	46	80
EAST CARIBBEAN REG.	HEALTH	26	69
EAST CARIBBEAN REG.	RURAL & INSTITUTIONAL DEV	18	
ECUADOR	AGRICULTURE	74	28
ECUADOR	EDUCATION	11	35
ECUADOR	FORESTRY & ENVR NAT RES	597	755
ECUADOR	HEALTH	233	266
ECUADOR	NUTRITION	78	62
ECUADOR	POPULATION	951	1968
ECUADOR	RURAL & INSTITUTIONAL DEV	146	29
EGYPT	AGRICULTURE	44	33
EGYPT	EDUCATION	45	75
EGYPT	ENERGY	114	262
EGYPT	HEALTH	61	7
EGYPT	NUTRITION	184	157
EGYPT	POPULATION	2258	1864

COUNTRY	SUBJECT	FY 1987 FUNDING	FY 1988 FUNDING
EL SALVADOR	AGRICULTURE		1
EL SALVADOR	ENERGY		12
EL SALVADOR	HEALTH	12	140
EL SALVADOR	NUTRITION	5	17
EL SALVADOR	POPULATION	510	243
EL SALVADOR	RURAL & INSTITUTIONAL DEV	50	
EQUATORIAL GUINEA	POPULATION	3	2
ETHIOPIA	AGRICULTURE	12	4
ETHIOPIA	NUTRITION		35
ETHIOPIA	POPULATION	3	2
FIJI	AGRICULTURE	26	15
FIJI	ENERGY	15	
FIJI	FORESTRY & ENVR NAT RES	1	4
FIJI	HEALTH	27	
FIJI	POPULATION	33	28
GABON	POPULATION	1	2
GAMBIA	AGRICULTURE	3	
GAMBIA	FORESTRY & ENVR NAT RES	10	
GAMBIA	HEALTH	74	23
GAMBIA	NUTRITION	17	
GAMBIA	POPULATION	125	93
GHANA	AGRICULTURE	7	
GHANA	ENERGY	32	88
GHANA	FORESTRY & ENVR NAT RES		29
GHANA	HEALTH	352	1026
GHANA	NUTRITION	13	13
GHANA	POPULATION	1327	2251
GRENADA	AGRICULTURE	39	4
GRENADA	EDUCATION	48	24
GRENADA	FORESTRY & ENVR NAT RES		6
GRENADA	INTL TRAINING	7	
GRENADA	POPULATION		10
GUADELOUPE	AGRICULTURE	4	
GUATEMALA	AGRICULTURE	165	190
GUATEMALA	FORESTRY & ENVR NAT RES	5	150
GUATEMALA	HEALTH	373	398
GUATEMALA	NUTRITION	22	36
GUATEMALA	POPULATION	689	757
GUATEMALA	RURAL & INSTITUTIONAL DEV	85	71
GUINEA	FORESTRY & ENVR NAT RES	9	
GUINEA	POPULATION	33	7
GUINEA	RURAL & INSTITUTIONAL DEV	8	6
GUINEA-BISSAU	AGRICULTURE	7	11
GUINEA-BISSAU	HEALTH		14
GUINEA-BISSAU	POPULATION	17	4
GUYANA	POPULATION	1	2
HAITI	AGRICULTURE	34	2
HAITI	EDUCATION	194	190
HAITI	ENERGY	26	10
HAITI	FORESTRY AND ENVR NAT RES		8
HAITI	HEALTH	1362	261
HAITI	NUTRITION	158	173
HAITI	POPULATION	846	317
HAITI	RURAL & INSTITUTIONAL DEV	38	

COUNTRY	SUBJECT	FY 1987 FUNDING	FY 1988 FUNDING
HONDURAS	AGRICULTURE	376	463
HONDURAS	EDUCATION	348	354
HONDURAS	ENERGY	15	14
HONDURAS	FORESTRY & ENVR NAT RES	15	53
HONDURAS	HEALTH	176	30
HONDURAS	NUTRITION	69	29
HONDURAS	POPULATION	408	680
HONDURAS	RURAL & INSTITUTIONAL DEV	95	45
HONDURAS	RESEARCH AND UNIVERSITY REL	75	
HONG KONG	POPULATION	42	13
INDIA	AGRICULTURE	158	134
INDIA	ENERGY	156	342
INDIA	FORESTRY & ENVR NAT RES	214	152
INDIA	HEALTH	359	106
INDIA	NUTRITION	8	5
INDIA	POPULATION	989	550
INDIA	RURAL & INSTITUTIONAL DEV	70	84
INDONESIA	AGRICULTURE	1457	1303
INDONESIA	EDUCATION	376	534
INDONESIA	ENERGY	199	97
INDONESIA	FORESTRY & ENVR NAT RES	215	288
INDONESIA	HEALTH	1475	588
INDONESIA	NUTRITION	540	614
INDONESIA	POPULATION	3792	2444
INDONESIA	RURAL & INSTITUTIONAL DEV	102	166
IRAQ	POPULATION	5	8
ISRAEL	POPULATION	16	46
IVORY COAST	AGRICULTURE	9	2
IVORY COAST	FORESTRY & ENVR NAT RES	7	
IVORY COAST	HEALTH	45	
IVORY COAST	NUTRITION	20	3
IVORY COAST	POPULATION	1157	1159
JAMAICA	AGRICULTURE	13	20
JAMAICA	ENERGY	525	446
JAMAICA	FORESTRY & ENVR NAT RES	70	17
JAMAICA	HEALTH	172	131
JAMAICA	INTL TRAINING	14	
JAMAICA	NUTRITION	37	108
JAMAICA	POPULATION	442	1576
JAMAICA	RURAL & INSTITUTIONAL DEV	5	
JAMAICA	RESEARCH & UNIVERSITY REL	137	
JORDAN	AGRICULTURE	26	35
JORDAN	EDUCATION	11	125
JORDAN	ENERGY	198	222
JORDAN	HEALTH	47	129
JORDAN	NUTRITION		12
JORDAN	POPULATION	111	240
JORDAN	RURAL & INSTITUTIONAL DEV	100	5
JORDAN	RESEARCH & UNIVERSITY RE	56	
KENYA	AGRICULTURE	1068	920
KENYA	EDUCATION		2
KENYA	ENERGY	34	179
KENYA	FORESTRY & ENVR NAT RES	470	320
KENYA	HEALTH	211	582
KENYA	NUTRITION	491	59
KENYA	POPULATION	3464	2634
KENYA	RURAL & INSTITUTIONAL DEV	27	114

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Yugoslavia	HHS	Biomedical Sciences	74/11	92/11	365	Under U.S.-Yugoslavia agreement on cooperation in S&T for cardiovascular, pulmonary & metabolic diseases, neurosciences, cancer, human reproduction & individual health scientist exchanges, & alcohol research; uses U.S.-Yugoslav Joint Fund
Yugoslavia	NIST	Basic Sciences	80/06	Indef	250	Projects conducted under the umbrella S&T agreement; 40 active projects with Yugoslav institutions in FY 1988 covering a wide range of mutual interests
Yugoslavia	NRC	Nuclear Safety	85/09	90/09	nb	Information exchange
Yugoslavia	NSF	Basic Sciences	80/06	Indef		Projects under S&T umbrella agreement; Joint Board provides support in US dollars & Yugoslav dinars from Joint Fund; joint research; short-term visits
Yugoslavia	US Gov	S&T Umbrella	88/06	93/06		Agreement on scientific & technological cooperation; US funding is \$10 million over a 5-year period, and this is matched in local currency by the Yugoslavs; project funding is governed through the Joint Board from the Joint Fund

COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Yugoslavia	USDA	Agricultural Science	80/06	Indef		Joint agricultural S&T, in part funded through the US-Yugoslav Joint Board; livestock & crop management; control of livestock diseases; biologic control of pests
Yugoslavia	USGS	Earth Sciences	80/06	Indef	13	Projects under the S&T umbrella agreement; Joint Fund provides \$25,000 for 7 projects in agrogeology, seismic research, geochemical exploration methods, coal resources, granite metamorphic complexes & remote sensing and water and soil sampling
Zaire	BReclam	Energy	84/07	88/03		Electric power; advisory assistance in operation of extra-high voltage DC transmission lines; training; institution building; funding by Zaire of \$50,000
Zaire	HHS	Biomedical Sciences	84/01	Indef	400	Belgian Ministry of Health, U.S. Centers for Disease Control, National Institutes of Health, Belgian Institute of Tropical Medicine and U.S. Armed Forces Institute of Pathology cooperate in AIDS surveillance, research and prevention

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COUNTRY	AGENCY	SUBJECT AREA	ENTRY INTO FORCE (Y/M)	TERM- INATION DATE (Y/M)	FUNDING (\$ X 1000)	REMARKS
Zimbabwe	USDA	Agricultural Science				Joint Agricultural Working Group Meeting held in Washington

COUNTRY	SUBJECT	FY 1987 FUNDING	FY 1988 FUNDING
KIRIBATI	HEALTH		7
KOREA, REPUBLIC OF	AGRICULTURE	6	
KOREA, REPUBLIC OF	HEALTH	24	50
KOREA, REPUBLIC OF	POPULATION	13	7
KUWAIT	POPULATION	3	5
LATIN AMERICA	AGRICULTURE	2	
LATIN AMERICA	EDUCATION		5
LATIN AMERICA	ENERGY	50	125
LATIN AMERICA	FORESTRY & ENVR NAT RES	47	91
LATIN AMERICA	HEALTH	362	7
LATIN AMERICA	INTL TRAINING	78	
LATIN AMERICA	POPULATION	476	67
LATIN AMERICA	RURAL & INSTITUTIONAL DEV	35	
LESOTHO	AGRICULTURE		4
LESOTHO	EDUCATION	4	5
LESOTHO	HEALTH	221	71
LESOTHO	NUTRITION	75	62
LESOTHO	POPULATION	61	244
LIBERIA	EDUCATION	98	89
LIBERIA	ENERGY	37	53
LIBERIA	HEALTH	62	61
LIBERIA	INTL TRAINING	7	
LIBERIA	NUTRITION	21	
LIBERIA	POPULATION	741	1181
MADAGASCAR	AGRICULTURE	10	6
MADAGASCAR	ENERGY	25	20
MADAGASCAR	FORESTRY & ENVR NAT RES	10	40
MADAGASCAR	HEALTH	23	40
MADAGASCAR	NUTRITION	81	
MADAGASCAR	POPULATION	150	78
MADAGASCAR	RURAL & INSTITUTIONAL DEV	1	1
MALAWI	AGRICULTURE	70	66
MALAWI	EDUCATION	2	
MALAWI	HEALTH	325	214
MALAWI	NUTRITION	266	175
MALAWI	POPULATION	97	189
MALAWI	RURAL & INSTITUTIONAL DEV		110
MALAYSIA	AGRICULTURE	11	15
MALAYSIA	ENERGY	15	
MALAYSIA	FORESTRY & ENVR NAT RES	11	
MALAYSIA	HEALTH	49	35
MALAYSIA	POPULATION	73	87
MALI	AGRICULTURE	323	60
MALI	FORESTRY & ENVR NAT RES	4	
MALI	HEALTH	48	23
MALI	NUTRITION		9
MALI	POPULATION	624	380
MALI	RURAL & INSTITUTIONAL DEV	125	240
MAURITANIA	AGRICULTURE	2	
MAURITANIA	ENERGY		14
MAURITANIA	FORESTRY & ENVR NAT RES	1	7
MAURITANIA	HEALTH	31	85
MAURITANIA	NUTRITION	5	80
MAURITANIA	POPULATION	59	67
MAURITANIA	RURAL & INSTITUTIONAL DEV	4	

COUNTRY	SUBJECT	FY 1987 FUNDING	FY 1988 FUNDING
MAURITIUS	HEALTH	21	
MAURITIUS	INTL TRAINING	7	
MAURITIUS	NUTRITION		40
MAURITIUS	POPULATION	386	272
MEXICO	AGRICULTURE	74	132
MEXICO	FORESTRY & ENVR NAT RES	2	
MEXICO	HEALTH	269	425
MEXICO	NUTRITION		205
MEXICO	POPULATION	7568	6106
MEXICO	RURAL & INSTITUTIONAL DEV	35	85
MOROCCO	AGRICULTURE	491	442
MOROCCO	ENERGY	35	28
MOROCCO	FORESTRY & ENVR NAT RES	3	59
MOROCCO	HEALTH	22	94
MOROCCO	POPULATION	1196	1096
MOZAMBIQUE	AGRICULTURE	7	
MOZAMBIQUE	HEALTH		8
MOZAMBIQUE	POPULATION	34	
NEAR EAST REGIONAL	AGRICULTURE	5	
NEAR EAST REGIONAL	ENERGY	108	80
NEAR EAST REGIONAL	POPULATION	590	
NEPAL	AGRICULTURE	22	13
NEPAL	EDUCATION	380	375
NEPAL	ENERGY	25	36
NEPAL	FORESTRY & ENVR NAT RES	156	205
NEPAL	HEALTH	41	106
NEPAL	NUTRITION	4	205
NEPAL	POPULATION	1950	818
NEPAL	RURAL & INSTITUTIONAL DEV	11	27
NETHERLAND ANTILLES	POPULATION		3
NICARAGUA	AGRICULTURE	4	
NIGER	AGRICULTURE	1200	1044
NIGER	ENERGY	44	
NIGER	FORESTRY & ENVR NAT RES	2	25
NIGER	HEALTH	104	47
NIGER	NUTRITION	105	403
NIGER	POPULATION	743	648
NIGER	RURAL & INSTITUTIONAL DEV	10	
NIGER	RESEARCH & UNIVERSITY REL	55	
NIGERIA	AGRICULTURE	109	76
NIGERIA	FORESTRY & ENVR NAT RES	7	
NIGERIA	HEALTH	180	141
NIGERIA	INTL TRAINING	56	
NIGERIA	NUTRITION	107	91
NIGERIA	POPULATION	5482	3460
NIGERIA	RESEARCH & UNIVERSITY REL	40	
OMAN	AGRICULTURE	15	10
PAKISTAN	AGRICULTURE	86	32
PAKISTAN	EDUCATION	37	78
PAKISTAN	ENERGY	156	272
PAKISTAN	FORESTRY & ENVR NAT RES	201	152
PAKISTAN	HEALTH	446	368
PAKISTAN	POPULATION	936	1216
PAKISTAN	RURAL & INSTITUTIONAL DEV	5	71

COUNTRY	SUBJECT	FY 1987 FUNDING	FY 1988 FUNDING
PANAMA	AGRICULTURE	230	20
PANAMA	FORESTRY & ENVR NAT RES	3	
PANAMA	HEALTH		6
PANAMA	POPULATION	127	190
PANAMA	RURAL & INSTITUTIONAL DEV	3	
PAPUA NEW GUINEA	EDUCATION	818	750
PAPUA NEW GUINEA	HEALTH	175	136
PAPUA NEW GUINEA	NUTRITION	15	
PAPUA NEW GUINEA	POPULATION	38	151
PARAGUAY	AGRICULTURE	24	
PARAGUAY	HEALTH	158	51
PARAGUAY	POPULATION	367	182
PARAGUAY	RURAL & INSTITUTIONAL DEV	2	2
PERU	AGRICULTURE	1494	1473
PERU	EDUCATION	125	150
PERU	ENERGY		104
PERU	HEALTH	336	469
PERU	NUTRITION	190	104
PERU	POPULATION	2644	3062
PERU	RURAL & INSTITUTIONAL DEV	118	183
PHILIPPINES	AGRICULTURE	535	412
PHILIPPINES	ENERGY	117	259
PHILIPPINES	FORESTRY & ENVR NAT RES	231	306
PHILIPPINES	HEALTH	834	832
PHILIPPINES	INTL TRAINING	133	
PHILIPPINES	NUTRITION	366	217
PHILIPPINES	POPULATION	991	1188
PHILIPPINES	RURAL & INSTITUTIONAL DEV	175	202
PORTUGAL	ENERGY	13	
PORTUGAL	FORESTRY & ENVR NAT RES	2	
PORTUGAL	HEALTH		10
REDSO/WA	NUTRITION	5	
ROCAP	AGRICULTURE	60	150
ROCAP	ENERGY		200
ROCAP	HEALTH	102	151
RWANDA	AGRICULTURE	325	270
RWANDA	FORESTRY & ENVR NAT RES	206	223
RWANDA	HEALTH	19	40
RWANDA	NUTRITION	78	
RWANDA	POPULATION	401	549
RWANDA	RURAL & INSTITUTIONAL DEV	19	62
RWANDA	RESEARCH & UNIVERSITY REL	46	
RYUKYU IS (JAPAN)	POPULATION		81
SAUDI ARABIA	AGRICULTURE	6	
SAUDI ARABIA	ENERGY		5
SAUDI ARABIA	POPULATION	4	7
SENEGAL	AGRICULTURE	341	157
SENEGAL	ENERGY	3	
SENEGAL	FORESTRY & ENVR NAT RES	23	6
SENEGAL	HEALTH	61	522
SENEGAL	NUTRITION	9	5
SENEGAL	POPULATION	1281	1758
SENEGAL	RURAL & INSTITUTIONAL DEV	133	185
SEYCHELLES	ENERGY	10	
SEYCHELLES	POPULATION	4	3

COUNTRY	SUBJECT	FY 1987 FUNDING	FY 1988 FUNDING
SIERRA LEONE	FORESTRY & ENVR NAT RES	6	2
SIERRA LEONE	HEALTH	15	47
SIERRA LEONE	NUTRITION	24	56
SIERRA LEONE	POPULATION 304	263	
SIERRA LEONE	RURAL & INSTITUTIONAL DEV	5	5
SINGAPORE	AGRICULTURE	6	
SINGAPORE	POPULATION	33	72
SOLOMON ISLANDS	HEALTH	522	16
SOMALIA	AGRICULTURE	10	
SOMALIA	EDUCATION	446	375
SOMALIA	ENERGY	18	
SOMALIA	HEALTH	113	7
SOMALIA	NUTRITION	20	
SOMALIA	POPULATION	299	222
SOMALIA	RURAL & INSTITUTIONAL DEV	108	128
SOUTH AFRICA, REPUBLIC OF	FORESTRY & ENVR NAT RES	9	
SOUTH AFRICA, REPUBLIC OF	POPULATION	8	13
SOUTH AFRICA, REPUBLIC OF	RURAL & INSTITUTIONAL DEV	25	5
SOUTH PACIFIC REG.	AGRICULTURE	38	35
SOUTH PACIFIC REG.	ENERGY	1000	24
SOUTH PACIFIC REG.	HEALTH	36	58
SOUTH AFRICA REG.	RURAL & INSTITUTIONAL DEV	8	6
SRI LANKA	AGRICULTURE	81	16
SRI LANKA	EDUCATION	99	120
SRI LANKA	ENERGY		5
SRI LANKA	FORESTRY & ENVR NAT RES	150	193
SRI LANKA	HEALTH	75	20
SRI LANKA	NUTRITION	45	
SRI LANKA	POPULATION	1489	909
SRI LANKA	RURAL & INSTITUTIONAL DEV	6	167
SRI LANKA	RESEARCH & UNIVERSITY REL	41	
ST. LUCIA	AGRICULTURE	4	
ST. LUCIA	POPULATION	6	
ST. LUCIA	RURAL & INSTITUTIONAL DEV	10	20
ST. LUCIA	RESEARCH & UNIVERSITY REL	54	
ST. VINCENT	AGRICULTURE	4	
ST. VINCENT	FORESTRY & ENVR NAT RES	2	
ST. VINCENT	INTL TRAINING	7	
SUDAN	AGRICULTURE	281	276
SUDAN	ENERGY	26	85
SUDAN	FORESTRY & ENVR NAT RES	29	29
SUDAN	HEALTH		79
SUDAN	NUTRITION	575	552
SUDAN	POPULATION	456	831
SUDAN	RURAL & INSTITUTIONAL DEV	1	
SURINAME	AGRICULTURE	4	
SURINAME	POPULATION	2	2

COUNTRY	SUBJECT	FY 1987 FUNDING	FY 1988 FUNDING
SWAZILAND	AGRICULTURE	12	12
SWAZILAND	EDUCATION	2	
SWAZILAND	HEALTH	72	45
SWAZILAND	NUTRITION	15	115
SWAZILAND	POPULATION	75	63
SWAZILAND	RURAL & INSTITUTIONAL DEV	12	18
SWAZILAND	RESEARCH & UNIVERSITY REL	41	
SYRIA	AGRICULTURE	11	16
SYRIA	POPULATION	7	12
TAIWAN	AGRICULTURE	38	45
TAIWAN	POPULATION	9	15
TANGANYIKA	AGRICULTURE		100
TANZANIA	AGRICULTURE	99	78
TANZANIA	ENERGY		61
TANZANIA	HEALTH	9	92
TANZANIA	POPULATION	18	257
TANZANIA	RURAL & INSTITUTIONAL DEV		41
THAILAND	AGRICULTURE	486	547
THAILAND	EDUCATION	164	150
THAILAND	ENERGY	442	459
THAILAND	FORESTRY & ENVR NAT RES	530	651
THAILAND	HEALTH	1071	788
THAILAND	NUTRITION	142	176
THAILAND	POPULATION	2891	2216
THAILAND	RURAL & INSTITUTIONAL DEV	361	96
TOGO	EDUCATION	23	20
TOGO	HEALTH	70	115
TOGO	NUTRITION	25	
TOGO	POPULATION	430	416
TRINIDAD & TOBAGO	AGRICULTURE	4	2
TRINIDAD & TOBAGO	POPULATION	435	459
TRINIDAD & TOBAGO	RESEARCH & UNIVERSITY REL	121	
TUNISIA	AGRICULTURE	58	5
TUNISIA	FORESTRY & ENVR NAT RES	7	31
TUNISIA	HEALTH	203	47
TUNISIA	POPULATION	374	661
TUNISIA	RURAL & INSTITUTIONAL DEV	142	10
TUNISIA	RESEARCH & UNIVERSITY REL	43	
TURKEY	AGRICULTURE	27	15
TURKEY	ENERGY		53
TURKEY	FORESTRY & ENVR NAT RES	45	19
TURKEY	HEALTH	9	44
TURKEY	POPULATION	900	836
TURKEY	RURAL & INSTITUTIONAL DEV	175	
UGANDA	AGRICULTURE	48	30
UGANDA	ENERGY	31	
UGANDA	FORESTRY & ENVR NAT RES	13	10
UGANDA	HEALTH		75
UGANDA	NUTRITION		41
UGANDA	POPULATION	610	1736
UGANDA	RURAL & INSTITUTIONAL DEV	10	20
UGANDA	RESEARCH & UNIVERSITY REL	97	
UNITED ARAB EMIR.	POPULATION	1	1

COUNTRY	SUBJECT	FY 1987 FUNDING	FY 1988 FUNDING
URUGUAY	AGRICULTURE	4	1
URUGUAY	ENERGY		36
URUGUAY	POPULATION	266	107
VENEZUELA	AGRICULTURE	22	25
VENEZUELA	POPULATION	20	35
WESTERN SAMOA	POPULATION	1	1
YEMEN ARAB REP.	AGRICULTURE	90	10
YEMEN ARAB REP.	EDUCATION	285	340
YEMEN ARAB REP.	ENERGY	1	221
YEMEN ARAB REP.	HEALTH	51	251
YEMEN ARAB REP.	POPULATION	13	10
YEMEN ARAB REP.	RURAL & INSTITUTIONAL DEV	105	50
ZAIRE	AGRICULTURE	18	4
ZAIRE	FORESTRY & ENVR NAT RES		1
ZAIRE	HEALTH	831	571
ZAIRE	INTL TRAINING	28	
ZAIRE	NUTRITION	30	18
ZAIRE	POPULATION	1586	1673
ZAIRE	RURAL & INSTITUTIONAL DEV	61	214
ZAMBIA	AGRICULTURE	67	41
ZAMBIA	HEALTH	193	148
ZAMBIA	NUTRITION	10	5
ZAMBIA	POPULATION	702	191
ZAMBIA	RURAL & INSTITUTIONAL DEV	18	61
ZIMBABWE	AGRICULTURE	273	37
ZIMBABWE	EDUCATION	44	40
ZIMBABWE	ENERGY	22	
ZIMBABWE	FORESTRY & ENVR NAT RES	25	
ZIMBABWE	HEALTH	102	381
ZIMBABWE	INTL TRAINING	28	
ZIMBABWE	POPULATION	1946	2287
ZIMBABWE	RURAL & INSTITUTIONAL DEV	126	150

APPENDIX IV

U.S. AGENCY FOR INTERNATIONAL DEVELOPMENT

FUNDING BY PROGRAM AREA

AGENCY FOR INTERNATIONAL DEVELOPMENT
BUREAU FOR SCIENCE AND TECHNOLOGY
FUNDING OBLIGATIONS BY SUBJECT AREA - FY 1988

SUBJECT	PROJECT TITLE	FY 1988 FUNDING (WHOLE DOLLARS)
PROGRAM OFFICE	PROGRAM DEVELOPMENT AND SUPPORT	2,388,000
PROGRAM OFFICE	AID/PEACE CORPS SMALL PROJECT ASST	1,040,000
TOTAL PROG OFC		3,428,000
AGRICULTURE	INTL FERTILIZER DEVELOPMENT CENTER	3,460,000
AGRICULTURE	BIO-TECHNOLOGY LIMITING FACTORS	250,000
AGRICULTURE	SPRING X WINTER WHEAT	300,000
AGRICULTURE	SOIL MANAGEMENT SUPPORT SERVICE	660,000
AGRICULTURE	CRSP: SORGHUM/MILLET	2,700,000
AGRICULTURE	CRSP: BEANS AND COWPEAS	2,600,000
AGRICULTURE	CRSP-PROGRAM: SOILS MANAGEMENT	2,100,000
AGRICULTURE	STORAGE & PROCSSG OF FRUITS & VEGS	360,000
AGRICULTURE	GRSP-PROGRAM: SMALL RUMINANTS	2,800,000
AGRICULTURE	TECHNOLOGY OF SOIL MOISTURE MGT	560,000
AGRICULTURE	CRSP - POND DYNAMICS	920,000
AGRICULTURE	FISHERIES DEVEL SUPPORT SERVICES	255,000
AGRICULTURE	CRSP - PEANUTS	1,700,000
AGRICULTURE	INTERNTL BENCHMARK SITES NETWORK	1,080,000
AGRICULTURE	HOST RESIST INTEGRATED TICK CONT	100,000
AGRICULTURE	AGRICULTURAL POLICY ANALYSIS	840,000
AGRICULTURE	AGR TECH RES & DEVEL	1,354,270
AGRICULTURE	INT AGR RESEARCH CENTERS	1,594,730
AGRICULTURE	SOYBEAN UTILIZATION & RESEARCH	600,000
AGRICULTURE	SPECIAL CONSTRAINT RESEARCH	500,000
AGRICULTURE	BIOTECHNOLOGY TISSUE CULTURE	750,000
AGRICULTURE	IPM AND ENVIRONMENT PROTECTION	606,000
AGRICULTURE	R&D OF IMP SEED PROD/UTIL IN LDCS	255,000
AGRICULTURE	POSTHARVEST GRAIN SYSTEMS R&D	425,000
AGRICULTURE	CRSP: FISH/STOCK ASSESSMENT RSCH	715,000
AGRICULTURE	REPRODUCTIVE STUDIES ON MILKFISH	1,200,000
AGRICULTURE	VERTEBRATE PEST MANAGEMENT SYSTEMS	125,000
AGRICULTURE	IMPROVED BNF THRU BIO-TECHNOLOGY	780,000
AGRICULTURE	IMPRVD ANIML VACCINE THRU BIO-TECH	400,000
AGRICULTURE	IRRIGATION MGMT SUPPORT & RESEARCH	280,000
AGRICULTURE	AQUACULTURE RESEARCH AND SUPPORT	255,000
TOTAL AGRICULTURE		30,525,000
NUTRITION	SCIENTIFIC/TECH/PLNG SUPPORT	613,501
NUTRITION	IMPRV OF MATERNAL/INFANT DIET	2,300,000
NUTRITION	AGR., FOOD & NUTR SURVEILLANCE	704,000
NUTRITION	NUTR, EDUC AND SOC MKTG FLD SUPPT	700,000
NUTRITION	FOOD TECHNOLOGY FOR DEVELOPMENT	517,000
NUTRITION	COMBATTING IRON DEFICIENCY	279,000
NUTRITION	VITAMIN A FOR HEALTH	4,200,000
TOTAL NUTRITION		9,313,501
FOR & ENVR NAT RES	ENVR PLANNING AND MANAGEMENT	915,000
FOR & ENVR NAT RES	COASTAL RESOURCES MANAGEMENT	746,000
FOR & ENVR NAT RES	FOREST RESOURCES MANAGEMENT	1,617,000
FOR & ENVR NAT RES	FORESTRY FUELWOOD RES. AND DEVEL	1,900,000
FOR & ENVR NAT RES	CONSERV OF BIOLOGICAL DIVERSITY	900,000
TOTAL ENVR & NATURAL RESOURCES		6,078,000

FY 1988 FUNDING
(WHOLE DOLLARS)

SUBJECT	PROJECT TITLE	1988 FUNDING (WHOLE DOLLARS)
ENERGY	BIOENERGY SYSTEMS AND TECHNOLOGY	2,376,446
ENERGY	CONVENTIONAL ENERGY TECHNICAL ASST	544,970
ENERGY	ENERGY POLICY DEV AND CONSERVATION	4,139,598
ENERGY	RENEWABLE ENERGY APPL/TRN	938,986
ENERGY	ENERGY TRAINING	2,000,000
TOTAL ENERGY		10,000,000
EDUCATION	EDUC TECH: STUDIES & APPLICATIONS	260,000
EDUCATION	DEV. COMMUNICATION CLEARINGHOUSE	57,000
EDUCATION	RADIO SCIENCE	1,247,000
EDUCATION	IMPRVNG EFFIC OF ED. SYSTEMS II	1,000,000
EDUCATION	BASIC RES IN DEVELOPING SYSTEMS	1,000,000
EDUCATION	COMMUNIC FOR TECH TRANSFER IN AGR	143,000
EDUCATION	DEV COMMUNIC CLEARINGHOUSE II	40,000
EDUCATION	APPLIED TECH & MGT FOR EDUC DEV	
TOTAL EDUCATION		4,857,000
HEALTH	MALARIA IMMUNITY & VACCINE RSCH	8,485,687
HEALTH	COMMUNICATION FOR CHILD SURVIVAL	2,027,271
HEALTH	TROPICAL DISEASE RESEARCH	2,500,000
HEALTH	DEMOGR & FAMILY HEALTH SURVEYS	500,000
HEALTH	PRIM HEALTH CARE-OPERATIONS RSCH	2,210,000
HEALTH	TECHNOLOGY FOR PHC	2,300,272
HEALTH	DIARRHEAL DISEASE RESEARCH	2,773,000
HEALTH	HEALTH RESOURCES SUPPORT	1,152,865
HEALTH	MEDEX SUPPORT	531,379
HEALTH	DIAGNOSTIC TECHNOLOGY DEVEL	1,996,930
HEALTH	ORT-HELP	1,463,621
HEALTH	PEDIATRIC CHRONIC DIARRH DISEASE	150,000
HEALTH	WATER & SANITATION FOR HEALTH II	1,500,000
HEALTH	VACCINE DEVEL & HEALTH RESEARCH	1,003,285
HEALTH	VECTOR BIOLOGY AND CONTROL	1,486,861
HEALTH	CHILD SURVIVAL ACTION PROG SUPT	1,424,988
HEALTH	APPLIED DIARRHEAL DISEASE RSCH	1,523,443
HEALTH	SUPPLY PROMOTION & PROD OF ORT	500,000
HEALTH	GLOBAL AIDS PROGRAM-WHO	15,000,000
HEALTH	MATERN & NEONAT HLTH & NUTR	1,322,000
HEALTH	MALARIA FIELD TRIALS	1,838,080
HEALTH	HEALTHTECH	800,000
HEALTH	TECHNOLOGY FOR PHC II	3,000,000
HEALTH	TECH. ADVISORS IN CHILD SURVIVAL	970,318
HEALTH	AIDS TECHNICAL SUPPORT	6,685,680
HEALTH	WATER & SANITATION FOR HEALTH III	1,000,000
TOTAL HEALTH		64,145,680
POPULATION	POPULATION PROGRAM DEVEL/SUPPORT	1,788,000
POPULATION	FP INTERNTL ASSISTANCE PROGRAM	4,235,000
POPULATION	PROG FOR VOLUNT STERILIZATION-AVS	3,250,000
POPULATION	POP COMMUNICATIONS SERVICES	4,020,000
POPULATION	POPULATION COUNCIL PROGRAM	2,445,788
POPULATION	CONTRACEPTIVES PROCUREMENT	11,301,000
POPULATION	DEMOG & D FAMILY HEALTH SURVEYS	4,059,000
POPULATION	POPULATION TECHNICAL ASSISTANCE	500,000
POPULATION	CONTRACEPTIVE SOCIAL MARKETING	3,040,000
POPULATION	STRAT FOR IMPRVNG SERV DELIVERY	6,060,000
POPULATION	FP TRNG FOR PARAMED AUX.COMMUNIT	5,450,000
POPULATION	POP INFORMATION PROGRAM III	1,950,000
POPULATION	UNIV OVERSEAS SERVICE PROGRAM	290,000
POPULATION	FP ENTERPRISE	4,625,000
POPULATION	POP POLICY INITIATIVES	4,200,000

SUBJECT	PROJECT TITLE	FY 1988 FUNDING (WHOLE DOLLARS)
POPULATION	EXTEND FP SRVCS THRU WOMEN MANAG	800,000
POPULATION	FP LOGISTICS MANAGEMENT	3,000,000
POPULATION	MANAGEMENT TRAINING	2,300,000
POPULATION	NATURAL FP	2,575,000
POPULATION	FAMILY HEALTH INTERNATIONAL	8,651,000
POPULATION	FAMILY PLAN SERVICES-PATH FINDER	5,000,000
POPULATION	EXPANSION/IMPROV FP PROGRAMS	3,475,000
POPULATION	CONTRACEPTIVE RSCH & DEVEL	4,400,000
POPULATION	TRAINING REPRODUCTIVE HEALTH II	5,220,000
POPULATION	DEMOGRAPHIC DATA INITIATIVE	3,530,900
POPULATION	SERVICE EXPANSION & TECH SUPPORT	3,308,000
POPULATION	PROG FOR VOLUNT STERILIZATION-AVS	7,585,000
POPULATION	POP COUNCIL PROGRAM PHASE II	2,054,212
POPULATION	CONTRACEPTIVE SOCIAL MKTG II	3,375,000
TOTAL POPULATION		112,487,900
RES & UNIV RELATS	SINGLE SMOU-AGRICULTURE	1,037,000
RES & UNIV RELATS	PROJECT REVIEW	300,000
RES & UNIV RELATS	HBCU RESEARCH GRANTS	1,565,000
RES & UNIV RELATS	TECH ADVISORY SUPPORT SERVICES	1,060,000
RES & UNIV RELATS	JOINT MOUS-HEALTH	1,148,000
RES & UNIV RELATS	JOINT MOUS-AGRICULTURE	3,084,000
RES & UNIV RELATS	MATCH SUPT GRANTS PROG SUPT GR	350,000
TOTAL RESEARCH & UNIVERSITY RELATIONS		8,544,000
RURAL & INSTIT DEV	SMALL ENTERPR APPROCH TO EMPLOY	928,973
RURAL & INSTIT DEV	HUMAN SETTLMNTS & NAT RES SYS ANAL	400,000
RURAL & INSTIT DEV	MARKET AND TECHNOLOGY ACCESS	417,027
RURAL & INSTIT DEV	RSCH: ACCESS TO LAND/WATER/NAT RES	530,000
RURAL & INSTIT DEV	EXP. APPROACHES TO RURAL SAVINGS	360,000
RURAL & INSTIT DEV	PERFORMANCE MANAGEMENT	838,000
RURAL & INSTIT DEV	EMPLOY & ENTERPRISE POL ANAL	75,000
RURAL & INSTIT DEV	APPROP TECH INTERNATIONAL II	3,000,000
RURAL & INSTIT DEV	DEVEL STRATEGIES FOR FRAGILE LANDS	500,000
RURAL & INSTIT DEV	DECENTRALIZATION: FINANCE & MGT	400,000
RURAL & INSTIT DEV	AGR MKTG IMPROVEMENT STRATEGIES	250,000
RURAL & INSTIT DEV	MICRO-ENTERPRISE SUPPOR	50,000
RURAL & INSTIT DEV	FORESTRY/FUELWOOD RES/DEV	250,000
RURAL & INSTIT DEV	COMM FOR TECH TRANSFER IN AGRIC	250,000
TOTAL RURAL & INSTIT DEV		8,249,000
BUREAU TOTAL		257,628,081